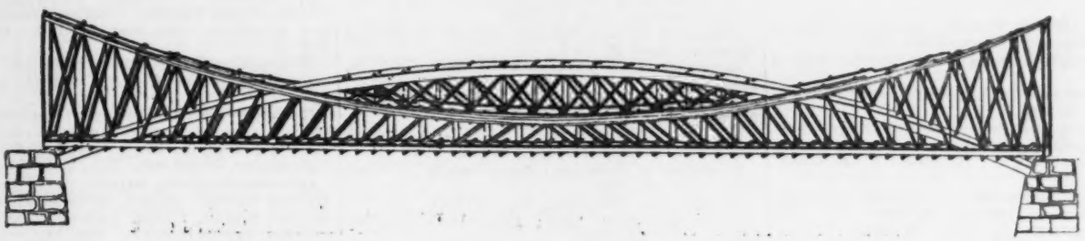
TRUSS BRIDGES.

AN ILLUSTRATED HISTORICAL DESCRIPTION OF ALL EXPIRED PATENTS ON TRUSS BRIDGES, WHICH UNDER THE LAW ARE NOW PUBLIC PROPERTY AND FREE TO BE USED BY ANY ONE.

By F. B. Brock, Patent Attorney, Washington, D. C.

April 1, 1856, George W. O. Huggens, of Missouri, received protection under the United States laws for a bridge truss.

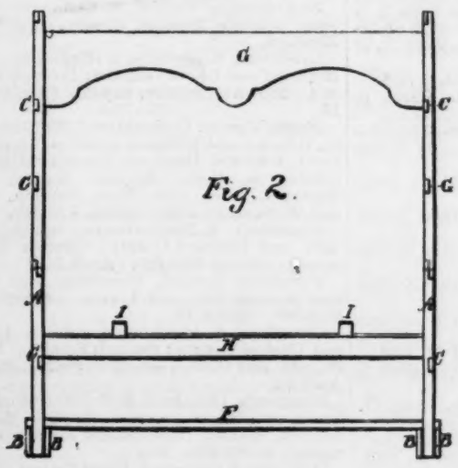
The lower arches in this construction are directly tied and braced to the floor, which is indirectly connected to the upper arches through the medium of the lower arches. The arches are arranged in parallel and vertical planes, with their curves reversed. The object of this arrangement is to prevent them from bodily intersecting each other at any point, and to enable them to cross each other without conjoining. The inventor states (as a reason that there should be no connection between the arches) that he contemplates the mechanical result of such forces when tied together is rest; they annihilate each other. In this way the effect of compression is compensated by its own effort," etc.

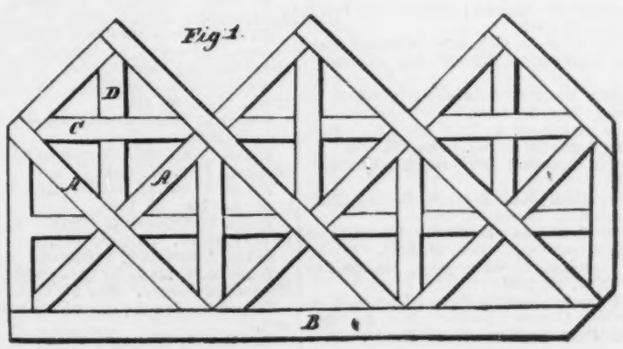


HUGGEN'S BRIDGE.

Truesdell's construction—patented June 3, 1856—consists of a mode wherein both the vertical and horizontal braces are combined, and the strain distributed equally over the whole bridge in both vertical and horizontal directions.

Figs. 1 and 2 show side and end elevation of the truss. The rafter timbers *A* intersect each other at an angle of about 90 degrees and at equal distances apart, forming a continuous lattice frame. *BB* are the chords. Between the angles of the squares formed by the rafters *A* are secured horizontal braces *C*, these being intersected at right angles by vertical braces *D* passing between the upper and lower angles of the same squares. The braces *D* serve to distribute the weight or pressure communicated to any part of the bridge over the whole, and thus relieve the parts immediately in the plane of pressure from undue strain.





TRUESDELL'S BRIDGE.

the utilization of two compressive forces acting in opposition to each other.

The upwardly curving arch receives its leverage in one direction, while the downwardly curving arch receives its strain in the opposite direction, thereby constituting, so the inventor says, a compensating bridge.

The specification is ambiguous in many parts. The following abstracts may, however, make the construction more clear: When a load is received upon the bridge the "compression is forced to divide itself in two compressive forces, the final results of which are caused to be in two directions which are directly opposed to each other." * * * "Said final results are caused to be perfectly equal in intensity, Upon the string beams *BB* are secured the under flooring *F*; or, instead of being supported upon the string beams, it may be secured upon cross ties *H* resting upon the horizontal braces *C*.

Sept. 30, 1856, letters patent were issued to Isaiah Rogers for a truss bridge. His construction of an arch bridge of wide span is stated to combine lightness and economy of material with perfect stability. Each *voussoir* in the formation of the arch is composed of tubes arranged in parallel ranks of concentric arcs, and in which the tubing of each component arc has a wider bearing towards the spring or abutment.

(TO BE CONTINUED.)

[From the *Railway Review.*]

RAILWAY INCORPORATIONS IN 1882.

(*Continued from page 76.*)

Arkansas.

Fiscal Years October, 1880, to October, 1882.

Arkansas & Texas. November 27, 1880.

Arkansas & Northern; Morrilton to Clinton. December 15, 1880.

Arkansas & Louisiana; Dermott to Arkansas and Louisiana State line. December 23, 1880.

Arkansas & Pacific; Danville to Wittsburg. February 2, 1881.

Arkansas & Pacific Western Extension; Danville to Scott County. February 8, 1881.

Arkansas & Pacific Eastern Extension; Wittsburg to Mound City. February 8, 1881.

Arkansas & Pacific; Russellville to Scott County, February 8. June 10, 1881.

Arkansas Northern (narrow); Van Buren to Missouri State line, Benton county. August 31, 1881.

Arkansas City & Missouri; Arkansas City to Pendleton Landing. September 6, 1881.

Arkansas Valley; Beebe to Fort Smith. August 5 1880.

Batesville & Jacksonport; Batesville to Jacksonport. July 20, 1881.

Bentonville & Fort Smith; Bentonville to Fort Smith. December 14, 1880.

Batesville & Brinkley; Batesville to Brinkley. December 1, 1881.

Bentonville; Bentonville to western boundary of Benton county. February 11, 1882.

Batesville & Brinkley. May 19, 1882.

Beebe & Clarendon; Beebe to Clarendon. July 27, 1882.

Camden & Gurdon; Camden to Gurdon. March 26, 1881.

Cotton Plant; Brinkley to Augusta. April 16, 1881.

Dermott & State Line; Dermott to southern boundary line Ashley County. December 23, 1880.

Des Arc & Beebe; Des Arc to Beebe. July 20, 1882.

Des Arc & Brinkley; Des Arc to Brinkley. August 8, 1882.

Fort Smith & Great Western; Fort Smith to Missouri line, Benton County. Oct. 19, 1880.

Fort Smith & Great Northern; Fort Smith to Benton. Jan. 29, 1880.

Fort Smith (street); city of Fort Smith. Aug. 2, 1881.

Greenville & Bowie; Greenville, Miss., to Desha County, Nov. 8, 1881.

Jonesborough (narrow); Jonesborough to Minturn. April 21, 1881.

Jacksonport & Newport; Jacksonport to Newport. May 24, 1881.

Iron Mountain & Helena; Helena to Peach Orchard. Feb. 11, 1881.

Kansas City & New Orleans; Missouri State line, Benton County to Monroe, La. Nov. 27, 1880.

Kansas, Fort Scott & Memphis; Harrison to near Memphis. Nov. 19, 1880.

Kansas City, Arkansas & Gulf Air Line; Benton County to Texas State line. Jan. 13, 1882.

Little Rock & Camden; Little Rock to Camden. Dec. 23, 1880.

Little Rock, Mississippi River & Texas; Little Rock to Texarkana. March 23, 1881.

Louisiana & Arkansas; Louisiana line, Chicot County, to Arkansas City. Dec. 21, 1881.

Memphis, Pine Bluff & Shreveport; Memphis to Shreveport. Nov. 16, 1880.

Memphis & Great Southwestern; Hopefield to Texas line, Miller County; profile. Nov. 18, 1880.

Memphis & Great Southwestern; profile. Dec. 10, 1880.

Malvern, Princeton & Southeastern; Malvern to near Hampton. Dec. 13, 1880.

Mississippi to White River Valley; Forrest City to Newport. Dec. 20, 1880.

Memphis & Great Southwestern; station 4,330–5,610. Dec. 21, 1880.

Missouri, Arkansas & Southern; Fayetteville to Little Rock & Fort Smith R. Jan. 14, 1881.

Missouri, Arkansas & Southern; Fayetteville to Little Rock & Fort Smith R. station 3,912–4,090. Jan. 14, 1881.

Missouri, Arkansas & Gulf; Fulton county to Columbia County. Feb. 8, 1881.

Memphis & Great Southwestern; station 4,330–5,610. Feb. 9, 1881.

Memphis, Pine Bluff & Texas; Pine Bluff to Jefferson, Tex.; Feb. 10, 1881; Memphis to Jefferson, Tex. Feb. 14, 1881.

Malvern, Warren & Bastrop; Malvern to State line, Ashley County. Feb. 16, 1881.

Malvern & Pine Bluff; Malvern to Pine Bluff. Feb. 18, 1881.

Missouri, Arkansas & Louisiana; Mississippi County to Ashley County. May 23, 1881.

Mississippi, Arkansas & Texas Pacific; Chicot County to Texas line, Miller County. Nov. 4, 1881.

Mississippi Valley; Lake Village to southern part of Chicot County. Jan. 9, 1882.

Mississippi, Albuquerque & Interocean; Chicot County to Polk County. Jan. 10, 1882.

Mississippi & White River Valley; Forrest City to Newport. Jan. 11, 1882.

Mississippi Valley; consolidated agreement of the Mississippi Valley and the Greenville & Bowie R's. May 15, 1882.

North Arkansas, Little Rock to Baxter County. July 30, 1880.

Northwestern Arkansas; Searcy County to Carroll County. July 30, 1880.

Osceola & Jonesboro'; Osceola to Jonesboro'. Mar. 8, 1881.

Pine Bluff & Malvern; Pine Bluff to Malvern. Dec. 18, 1880.

Pine Bluff & Camden; Pine Bluff to Camden. Dec. 23, 1880.

Pine Bluff & Dermott; Pine Bluff to Dermott. Dec. 23, 1880.

Pine Bluff, Arkadelphia & Texarkana; Pine Bluff to Texarkana. August 18, 1880.

Pacific & Great Eastern; Benton County to Mississippi County. Feb. 17, 1880.

Rogers & Eureka Springs; Rogers to Eureka Springs. April 19, 1881.

Rogers & Siloam; Rogers to Siloam. May 26, 1881.

Rogers & Electric Springs; Rogers to Electric Springs. July 31, 1882.

Red River Valley; Little River to Louisiana State line, Lafayette County. July 25, 1882.

Springfield & Memphis; Sharp county to Memphis. Nov. 10, 1880.

Springfield & Memphis. Nov. 10, 1881.

South Side Short Line; Little Rock to Fort Smith. Nov. 24, 1880.

St. Louis, Arkansas & Texas; State line; Benton County to Fayetteville. Dec. 9, 1880.

St. Louis, Fort Smith & Southern; Fort Smith to Texas line, Little River County. July 14, 1881.

St. Louis, Arkansas & Texas; station 3,800 to 3,912. Jan. 15, 1881.

Sulphur Springs & White River; Sulphur Springs to Sebastian County. Jan. 24, 1881.

South Side Short Line; Mound City to Fort Smith. Feb. 21, 1881.

St. Louis, Iron Mountain & Southern—Little Rock branch, Baring Cross bridge to Oil Mill, April 26; Missouri, Arkansas & Louisiana branch, Knobel to Ashley county, June 8; North Arkansas branch, O'Kean to Eureka Springs, June 8; Saline Valley branch, Traskwood to Ashley county, June 8, 1881.

St. Louis, Arkansas & Texas; consolidated agreement of the St. Louis, Arkansas & Texas R. of Missouri, St. Louis, Arkansas & Texas R. of Arkansas and Missouri, Arkansas & Southern R. of Arkansas. June 28, 1881.

Springfield & Memphis; profile. Oct. 6, 1881.

St. Louis, Arkansas & Texas; Van Buren to Fayetteville. Jan. 7, 1882.

St. Louis, Iron Mountain & Southern—Memphis branch, Newport to Memphis, May 16; White River branch, June 14, 1882.

Springfield & Southern; Springfield to Little Rock. June 22, 1882.

Searcy & West Point; Searcy to West Point. July 3, 1882.

Texas, Arkansas & Northern; Hopefield to Texarkana. Nov. 27, 1880.

Texas, Arkansas & Missouri; Marianna to Clay County. Dec. 29, 1880.

Texas, Fort Smith & Northwestern; Texarkana to Fort Smith. Jan. 28, 1881.

Texas, Arkansas & Northern. April 15, 1881.

Texas & St. Louis (of Arkansas); Texarkana to Mississippi County. May 21, 1881.

Texarkana Street; city of Texarkana. Aug. 11, 1881.

Van Buren, Talequah, Vinita & Junction City; Van Buren to Junction City, Kan. Feb. 14, 1881.

Van Buren & Arkansas Southern; Van Buren to Texarkana. Aug. 11, 1882.

Washington & Hope; Washington to Hope. April 20, Nov. 7, 1881.

Ohio.

From Nov. 15, 1881, to Nov. 15, 1882.

Middletown, Lebanon & Cincinnati; terminus, Lebanon, Warren County; through Butler and Warren counties; capital, $100,000. November 23, 1881.

Cleveland, Akron & Columbus; termini, Hudson and Columbus; through Summit, Wayne, Holmes, Knox, Delaware, Franklin, Coschocton and Muskingum counties; capital, $4,000,000. December 1, 1881.

Toledo & Detroit Air Line; terminus, Lucas County; through Lucas County; capital, $1,000,000. December 3, 1881.

Shawnee, Hocking Valley & Columbus; termini, Perry and Franklin counties; through Perry, Hocking, Fairfield, Pickaway and Franklin counties; capital, $800,000. December 5, 1881.

Newark & Edgewood; terminus, Licking County; through Licking County; capital, $50,000. December 10, 1881.

Newark, Delaware & Northwestern; termini, Licking and Allen counties; through Licking, Delaware, Union, Logan, Harding, Auglaize and Allen counties; capital, $2,000,000. December 10, 1881.

Cincinnati & St. Louis Air Line; terminus, Hamilton County; through Hamilton County; capital, $100,000. December 17, 1881.

Cincinnati & Richmond; termini, Hamilton and Prebble counties; through Hamilton, Butler and Prebble counties; $2,500,000. December 22, 1881.

Cincinnati Tunnel; terminus, Hamilton County; through Hamilton County; capital, $1,000,000. Dec. 27, 1881.

Monday Creek; termini, Perry and Athens counties; through Perry Hocking and Athens counties; capital, $500,000. Jan. 4, 1882.

Pittsburgh & Chicago; termini, Delphos and Van Wert counties; through Allen and Van Wert; capital, $20,000. Jan. 13.

Chicago & Hocking Valley; termini, Mercer and Meigs Counties;, through Mercer, Auglaize, Shelby, Miami, Champaign, Clarke, Greene, Montgomery, Madison, Pickaway, Fairfield, Hocking, Athens, Meigs, Fayette, Clinton, Warren, Butler and Hamilton counties; capital, $20,000,000. Jan. 16.

Metropolitan; terminus, Hamilton County; through Hamilton County; capital, $1,000,000. Jan. 20.

Hocking Valley Coal & Iron; termini, Columbus and Athens counties; through Franklin, Pickaway, Fairfield, Hocking, Perry and Athens counties; capital, $1,000,000. Feb. 3.

Lakeside Southern; termini, Lakeside and Columbus; through Ottawa, Sandusky, Seneca, Wyandotte, Marion, Union, Delaware and Franklin counties; capital, $50,000. Feb. 14.

Columbus & Eastern; termini, Columbus and Marietta; through Franklin, Fairfield, Perry, Muskingum, Morgan, Athens and Washington counties; capital, $1,000,000. Feb. 20.

Chesapeake, Columbus & Michigan; termini, Franklin and Van Wert counties; through Franklin, Madison, Union, Logan, Shelby, Auglaize, Mercer and Van Wert; capital, $50,000. Feb. 21.

Marietta Mineral; termini, Marietta and Athens; through Washington and Athens counties; capital, $300,000. Feb. 22.

Defiance & Columbus; termini, Defiance and Franklin counties; Defiance, Putnam, Allen, Hancock, Hardin, Logan, Union, Delaware and Franklin counties; capital, $50,000. March 2.

Columbus & Ohio River; termini, Franklin and Brown counties; through Franklin, Pickaway, Fayette, Clinton, Highland and Brown counties; capital, $100,000. March 4.

St. Clairsville; termini, St. Clairsville and Bartons; through Belmont County; capital, $5,000. March 10.

Lynchburg, Georgetown & Higginsport; termini, Highland and Brown counties; through Highland and Brown counties; capital, $100,000. March 13.

Mount Vernon, Coshockton & Wheeling; termini, Belmont and Williams counties; through Belmont, Jefferson, Harrison, Tuscarawas, Guernsey, Coschocton, Knox, Morrow, Marion, Hardin, Wyandot, Allen, Van Wert, Putnam, Defiance and Williams counties; capital, $100,000. April 4.

Cincinnati & Northwestern; termini, Cincinnati and Harrison County; through Hamilton county; capital, $500,000. April 27.

Vermillion; termini, Vermillion and Wellington; through Erie and Lorain counties; capital, $500,000. March 27.

Columbus & Cincinnati; termini, Columbus and Clinton County; through Franklin, Madison, Fayette and Clinton counties; capital, $2,000,000. April 13.

Pittsburgh, Cleveland & Toledo; termini, Mahoning and Wayne counties; through Mahoning, Summit, Medina, Trumbull and Portage counties; capital, $2,900,000. May 1.

Columbus & Glenwood Rapid Transit; termini, north end of Gill and Hughes avenue and west end of State street bridge; through Franklin County; capital $100,000. May 15.

Cincinnati Cable R. Co.; terminus, yard of the Cincinnati, Indianapolis, St. Louis & Chicago R. Co. and yard of the Little Miami R. Co.; through the city of Cincinnati; capital, $500,000. June 8.

Cincinnati Circular; terminus, beginning near Ohio river at eastern end of Cincinnati, thence near same at western end of Cincinnati and thence to place of beginning; through Hamilton; capital, $3,000,000. June 13.

Cincinnati, Atlantic & Columbus; termini, Cincinnati, Hamilton County, Gallia County, Fayetteville, Brown County and Columbus, Franklin County; through Hamilton, Clermont, Brown, Highland, Pike, Jackson and Gallia—with branch through Brown, Highland, Clinton, Fayette, Pickaway and Franklin counties; capital $3,500,000. June 15.

Toledo Belt; terminus where the south and east corporation lines of Toledo intersect the east bank of the Maumee River; through Lucas; capital, $300,000. June 27.

Ohio River & Indiana; termini, State line in Mercer County and State line in Jefferson county; through Mercer, Auglaize, Hardin, Marion, Mor

row, Knox, Coshocton, Tuscarawas, Harrison and Jefferson counties; capital, $5,000,000. Aug. 2.

New York & Council Bluffs; termini, State line in Mahoning County and State line in Paulding County; through Mahoning, Portage, Summit, Medina, Lorain, Huron, Seneca, Hancock, Putnam and Paulding counties; capital, $2,000,000. Aug. 3.

Cincinnati Elevated; termini, junction of Walnut and Fifth streets and northern boundary of Cincinnati near Clifton; through Hamilton; capital, $1,000. Aug. 16.

Cincinnati & Eastern Connection; terminus, Avondale Valley junction; through Hamilton County; capital, $100,000. Sept. 4.

Hocking Valley & Northwestern; termini, Kingston (Ohio) and Fort Wayne; through Ross, Richland, Fayette, Madison, Clarke, Champaign, Logan, Shelby, Auglaize, Mercer and Van Wert counties; capital; $1,500,000. Oct. 24.

Cincinnati, Portsmouth & Gallipolis; termini, Portsmouth and Gallipolis; through Scioto, Lawrence and Gallia counties; capital $1,000,000. Oct. 5.

Muskingum River, termini, Zanesville and Marietta; through Washington, Morgan and Muskingum counties; capital, $50,000. Nov. 3.

Grafton & Oberlin; termini, Grafton and Oberlin; through Lorain County; capital, $200,000. Nov. 6.

Toledo & Michigan; termini, Toledo and State Line; through Lucas County; capital, $5,000,000. Nov. 9.

Pittsburgh, Akron & Chicago; termini, Youngstown and west line of Medina county; through Mahoning, Portage, Summit and Medina counties; capital, $50,000. Nov. 13.

OHIO COMPANIES CONSOLIDATED.

Ohio Central R. Co. and the Atlantic & Northwestern R. Co.; as the Ohio Central R. Co.; capital, $35,000,000. Jan. 27,

Bellaire & Southwestern R. Co. and the Zanesville & Southeastern R. Co.; as the Bellaire, Zanesville & Cincinnati R. Co.; capital, $3,000,000. Feb. 27.

Toledo, Delphos & Burlington R. Co. and the Frankfort, St. Louis & Toledo R. Co. and the Toledo, Cincinnati & St. Louis R. Co.; as the Toledo, Cincinnati & St. Louis R. Co.; capital, $15,000,000. March 2.

Pittsburgh, Cleveland & Toledo, and the Pittsburgh, Cleveland & Toledo R. Co., as the Pittsburgh, Cleveland & Toledo R. Co.; capital, $3,000,000. June 29.

Cleveland, Youngstown & Pittsburgh R. Co. and the Steubenville, Canton & Cleveland R. Co. and Lake Erie R. C.; as the Cleveland, Youngstown & Pittsburgh R. Co.; capital, $1,000,000. July 24.

OHIO COMPANIES EXTENDING LINES, CHANGING TERMINI, ETC.

Lima & Columbus; terminus, Williams County; passing through Putnam, Paulding, Defiance and Williams counties. Dec. 31, 1881.

Bellaire, Beaver Valley & Shawnee; termini, Wheeling and Cincinnati; passing through Belmont, Noble, Guernsey, Morgan, Perry, Hecking, Ross, Highland, Brown, Clermont and Hamilton counties. Jan. 7.

Scioto Valley; termini, Ashland and Huntington counties. Feb. 7.

Scioto Valley; termini, Huntington and Fort Wayne, Ind.; passing through Franklin, Union, Logan, Shelby, Auglaize, Mercer and Van Wert. July 14.

Cincinnati Union; disclaimer of intention to proceed under articles of incorporation. March 3.

Cincinnati & Ohio River; location of branch line through the counties of Scioto, Jackson, Lawrence and Gallia to the Ohio River. May 8.

Pomeroy & Ohio River; definitely fixing eastern terminus in Gallia County. July 21.

Chicago & Hocking Valley; including Vinton County in the list of counties through which it passes. Aug. 3.

Youngstown & Austintown; building branch line to shaft of Mahoning Coal Co. Aug. 25.

Columbus & Cincinnati; change of route through Pickaway County. Oct. 27.

STREET RAILROADS.

Spring Street & Mt. Vernon Avenue; located at Columbus. Jan. 18; capital, $30,000.

Canton Street; located at Canton. Jan. 23; capital, $30,000.

Chestnut Ridge & Clark Avenue; located at Cleveland. April 1; capital, $100,000.

Akron Street R. & Herdic Co.; located at Akron. July 31; capital, $50,000.

Pomeroy, Minersville & Syracuse; located at Pomeroy. Nov. 7; capital, $250,000.

Union Street; located at Pomeroy. Nov. 7; capital, $50,000.

Pennsylvania.

Twelfth Street & Arlington Avenue; office, Pittsburgh; length, 2 miles; capital, $25,000. President, J. J. Speck, Pittsburgh. Directors, R. Liddell, M. Hunter, R. U. Ray, J. L. Abell. Jan. 4.

Pittsburgh & South End; office, Pittsburgh; length 3 miles; capital, $25,000. President, J. J. Speck, Pittsburgh. Directors, R. Liddell, M. Hunter, R. U. Ray, J. L. Abell. Jan. 4.

Belt Railway Co.; office, Pittsburgh; length, 2 miles; capital, $10,000. President, R. Liddell. Directors, J. J. Speck, M. Hunter, R. U. Ray, J. L. Abell. Jan. 4.

Delaware Valley; office, Milford, Pa.; length, 7 miles; capital, $100,000. President, A. E. Lewis, Milford. Directors, H. B. Wells, J. Klinhaus, P. Sound, J. H. Van Etten, A. D. Brown, J. J. Poullen, C. Raub, T. R. J. Klein. Jan. 20.

Tionesta & Allegheny River; office, Oil City; length, 58 miles; capital, $580,000. President, T. H. Wilson. Directors, T. H. Wilson, D. W. Clark, G. W. Evans, J. A. Lamson, W. H. Roth, C. Evans, J. B. McAllister, J. D. Graham. Jan. 26.

Oley Valley & Lehigh; length, 25 miles; capital, $600,000. President, J. O. Keim, Philadelphia. Directors, W. B. Griesemer, H. Y. Kaufman, G. K. Lorah, E. Z. Griesemer, I. M. Bertolet, J. B. Bertolet, S. K. Cleaver, D. B. Yoder, J. O. Keim. Jan. 30.

Connoquennessing Valley; length, not to exceed 15 miles; capital, $500,000. President, J. T. Blair; vice-president, J. M. Thompson. Directors, J. M. Thompson, C. McCandless, H. H. Steele, T. P. Fowler, J. A. Stranahan, W. C. Stinson, P. E. McCray; treasurer, J. D. Stinson. Jan. 31.

Pittsburgh Coal; length, 14 miles; capital, $300,000. President, J. F. Dravo, Beaver, Pa. Directors, S. Beymer, D. W. C. Carroll, G. A. Kelley, J. H. McCreery, R. B. Brown, W. Van Kirk, G. Trautman, S. Griffith, A. N. Suther, W. McClelland. Jan. 30.

New Haven & Youghiogheny; length, 25 miles; capital, $250,000. President, T. M. King, Pittsburgh. Directors, J. B. Washington, W. W. McCullogh, H. S. Burgesser, J. B. Caven, J. M. Cleave, J. D. Scully. Jan. 3.

Pittsburgh & Monongahela Valley; length, 15 miles; capital, $150,000. President, M. D. Hays, Pittsburgh. Directors, J. D. Redman, N. May, T. N. Miller. W. R. Stoughton, J. Reamer, T. F. Best, B. L. Crawford, T. Morris. Feb. 9.

Allegheny & Clarion; length, 50 miles; capital, $400,000. President, C. W. Mackey, Franklin. Directors, C. W. Mackey, W. H. Forbes, John M. Dickey, J. W. Rowland, W. J. Welsh, J. V. Pitts, G. W. Arnold, Wm. J. McConnell, J. Bennett. Feb. 9.

Shamokin, Sunbury & Lewisburg; length, 30 miles; capital, $300,000. President, S. P. Wolverton, Sunbury. Directors, A. H. Dill, J. C. Smith, L. Rooke, H. E. Davis, I. T. Clement, J. Haas, L. H. Kase. Feb. 17.

McKeesport Passenger R. Co.; length, 6 miles; capital stock, $18,000. President, J. C. Smith, McKeesport. Directors, M. Horn, J. B. Eisaman, A. J. Trich, E. P. Woods. Feb. 24.

Pittsburgh East End; length, 7½ miles; capital, $250,000. President, W. S. Bissell, Pittsburgh. Directors, H. S. A. Stewart, J. H. Lindsey, N. W. McDowell, W. H. Caldren, W. L. Chalfant, W. Flinn, Wilson McCandless, G. O. Whitney. Feb. 28.

Cornwall & Lebanon; length, 4 miles, capital, $15,000. President, R. H. Coleman, Cornwall, Pa. Directors, R. H. Coleman, G. D. Rise, B. F. Hean, G. Weidman. H. M. M. Maxwell, C. B. Forney, A. Hess, J. Meily. Feb. 28.

Phœnixville & West Chester; length, 20 miles; capital, $500,000. President, J. N. DuBarry, Philadelphia. Directors, G. B. Roberts, A. J. Cassatt, E. Smith, J. P. Green, G. M. Dorrance, N. P. Shortridge, J. P. Wetherhill, H. D. Welsh. March 8.

City Passenger R. Co. of Altoona; length, 3 miles; capital stock, $40,000. President, John P. Levan, Altoona, Pa. Directors, J. P. Levan, C. F. Berwind, M. Liveright, S. S. Blair, H. S. Frink, W. Murray, D. R. Ranney, F. W. Olmes, C. Jaggard. March 10.

Pottsville & New York; length, 30 miles; capital, $1,000,000. President, F. A. Babcock, Elizabeth, N. J. Directors, R. W. Lesley, T. B. Price, E. H. Gaskill, R. A. Wilder, W. S. Sheafer, J. J. Flanagan, J. H. Ferry. March 23.

New Castle Marginal; length, 2 miles; capital, $20,000. President, L. Raney, New Castle. Directors, F. Holton, M. S. Marquis, R. B. McComb, G. W. Johnson. J. McClain, O. H. P. Green, A. B. Berger, G. B. Berger, A. L. Hazen, W. B. Enos. March 20.

Parker & Cleveland; length, 12 miles; capital, $250,000. President, H. R. Fullerton, Parker, Pa. Directors, H. R. Fullerton, J. A. Parker, J. O. Wilson, W. J. Parker, M. S. Adams, S. H. Manifold, J. J. Campbell. March 20.

New City & Eldred; length, 15 miles; capital, $150,000. President, J. J. Carter, Titusville, Pa. Directors, Richard G. Taylor, B. C. Williams, J. J. Carter, W. W. Brown, A. J. Wilcox, W. C. Warner, J. C. McKenna, G. L. Roberts, H. E. Picket. March 18.

Danville & Shamokin; length, 20 miles; capital, $250,000. President, B. G. Welch, Riverside, Pa.; Treasurer, J. S. Bailey, Riverside, Pa. Directors, S. Bailey, J. S. Bailey, C. W. Woddross, J. Button, Jr., T. B. Reeves, J. Welch. March 13.

Oil City & Chicago; length, 40 miles; capital, $1,400,000. President, J. W. Jones, Philadelphia. Directors, C. H. Clark, G. F. Tyler, B. K. Jamieson, Harold M. Sell, H. A. V. Post, A. N. Martin, C. C. Pomeroy, C. E. Kimball. March 10.

Wilcox & Burning Well; length, 5 miles; capital, $30,000. President, M. M. Schultz, Wilcox, Pa. Directors, I. Schultz, C. W. Henry, J. Ernhoute, H. Schimmelfeng. April 27.

Ridgway & Clearfield; length, 28 miles; capital, $750,000. President, J. N. DuBarry, Philadelphia, Pa. Directors, G. B. Roberts, A. J. Cassatt, J. P. Green, G. M. Dorrance, N. P. Shortridge, H. D. Welsh. April 25.

Victor R. Co.; length, 2½ miles; capital, $25,000. President, David W. Holt, Philipsburg, Pa. Directors, J. Nuttall, J. M. Bacon, S. P. Griffiths, O. P. Jones, H. Bacon, G. W. McGaffey. April 18.

Tionesta & Forest; length, 15 miles; capital, $300,000. President, B. F. Neiswender, New York. Directors, C. P. Karr, J. N. Ayers, H. E. Brown, E. E. Simpson, J. R. Caldwell, Henry J. Miller, R. Brown. April 13.

Clarendon & Tionesta; length, 15 miles; capital, $300,000. President, C. P. Karr, Newark, N. J. Directors, J. N. Ayers, B. F. Neiswender, J. R. Caldwell, E. E. Simpson, H. E. Brown, H. J. Miller, R. Brown. April 11.

Coudersport & Port Allegheny; length, 17 miles; capital, $150,000. President, F. W. Knox, Coudersport, Pa. Directors, A. G. Olmsted, I. Benson, F. N. Root, A. M. Benton, B. D. Hamlin, C. S. Cary, C. V. B. Barse, F. N. Arnolds. April 11.

Warren & Farnsworth Valley; length, 12 miles; capital, $75,000. President, L. D. Wetmore, Warren, Pa. Directors, L. D. Wetmore, M. Waters, J. H. Eddy, C. W. Stone, A. J. Hazeltine, P. H. Rockwell, G. N. Parmlee, F. Henry, M. Beecher, T. Struthers. April 6.

Forest R. Co.; length, 10 miles; capital, $65,000. President, M. Waters, Warren, Pa. Directors, J. H. Eddy, W. White, A. J. Hazeltine, F. H. Rockwell, M. Waters, G. N. Parmlee, R. Dennison, W. H. Pickett, S. M. Hall, M. Beecher. April 5.

Pittsburgh & Turtle Creek; length, 10 miles; capital, $500,000. President, J. H. Stokes, Allegheny, Pa. Directors, W. W. Bissell, C. H. Owen, R. Swan, G. A. Chalfant, C. Donnelly, J. Rhodes, E. J. Roberts, J. L. Kennedy. May 19.

Brockwayville & Punxsutawney; length, 25 miles; capital, $250,000. President, W. H. Brown, York, Pa. Directors, W. H. Brown, F. A. Brown, T. F. Wentworth, H. P. Brown, E. Y. Platt, M. C. Riffehart, T. P. Street, W. M. Robb, J. M. Zehner. May 17.

Twin City Street R. Co.; length, 3 miles; capital, $50,000. President, R. Liddell, Pittsburgh, Pa. Directors, J. W. G. Smith, M. Hunter, J. L. Abell. May 11.

Pittsburgh, Cleveland & Toledo; length, 10 miles; capital, $100,000. President, J. B. Stevenson, Allegheny, Pa. Directors, J. B. Stevenson, C. P. Ford, V. Matthews, R. F. Ramsey, W. W. Armstrong, J. C. McPherson, W. J. Crozier. May 2.

Johnstown Passenger R. Co.; length, 8 miles; capital, $40,000. President, J. McMillen, Johnstown, Pa. Directors, J. McMillen, G. Webb, A. Foster, W. H. Rosensteel, H. Baumer, C. F. Kress, J. J. Murphy. May 8.

Sinnemahoning & Pine Creek; length, 27 miles; capital, $200,000. President, D. D. Warren, Springfield, Mass. Directors, W. Dent, H. T. Reynolds, M. Dykeman, J. M. Fuller, T. J. Melvin, G. H. Bush, R. P. Crafts, C. S. Bushnell. June 29.

Titusville & Sheffield; length, 50 miles; capital, $500,000. President, J. J. Carter, Titusville, Pa. Directors, W. B. Roberts, J. J. Carter, J. L. McKinney, J. Fertig, S. S. Fertig, O. Keese, W. B. Sterrett, E. O. Emerson, J. H. Caldwell, S. P. Franchot, J. H. Windsor. June 26.

State Line, Brookland & Pine Creek; length, 20 miles; capital, $120,000. President, G. H. Bush, Westfield, Mass. Directors, W. Dent, M. Dykeman, I. Benson, J. M. Fuller, F. A. Raymond, D. D. Warren, R. P. Crafts, A. N. Cole. June 24.

Clermont & Bradford; length, 14 miles; capital, $150,000. President, W. Hacker, Germantown, Pa. Directors, H. M. Albertson, A. A. Clay, A. H. Williams, H. L. Geyslin, H. G. Clay, A. J. Miller. June 10.

Garfield & Cherry Grove; length, 15 miles; capital, $200,000. President, G. H. Bush, Westfield, Mass. Directors, W. Dent, N. Bushnell, J. M. Fuller, T. J. Melvin, C. S. Bushnell, A. N. Cole, D. D. Warren, T. G. Hull. June 29.

Pike Mills & Kettle Creek; length, 40 miles; capital, $250,000. President, C. S. Bushnell, New Haven, Ct. Directors, W. Dent, H. T. Reynolds, C. L. Peck, J. M. Fuller, M. Dykeman, D. D. Warren, R. P. Crafts, C. D. Allen. June 29.

Williamsport & Clearfield; length, 30 miles; capital, $1,500,000. President, C. V. Sidell, New York. Directors, H. Croskey, H. M. Albertson, R. W. Clay, A. H. Williams, C. S. Riley, M. K. King, W. B. Hornblower, C. D. Ingersoll. July 5.

Tionesta & Clarion; length, 50 miles; capital, $1,000,000. President, J. W. Jones, Philadelphia, Pa, Directors, G. F. Tyler, E. A. Rollins, B. K. Jamison, C. H. Clark, H. M. Sill, J. R. Trimble, Archer N. Martin, H. A. V. Post, C. C. Pomeroy. July 10.

Shousetown, Clinton & Frankfort; length, 15 miles; capital, $150,000. President, A. Dempster, Pittsburgh, Pa. Directors, J. B. Williams, W. K. Gillespie, W. R. Kirkpatrick, W. B. Lucas, P. Sprague, T. Patterson, John Williams, Jas. Williams. July 10.

Bradford & Tiona; length, 12 miles; capital, $200,000. President, A. I. Wilcox, Bradford, Pa. Directors, A. F. Allen, R. E. Whitely, W. Dent, N. Bushnell, A. N. Cole, C. S. Bushnell, A. D. Tingley, D. L. Warren. July 10.

Garfield & Tionesta; length, 28 miles; capital, $300,000. President, A. N. Cole, Wellsville, N. Y. Directors, A. I. Wilcox. A. F. Allen, R. E. Whitely, W. Dent, N. Bushnell, R. P. Crafts, A. D. Tingley, G. H. Bush. July 10.

Addison & Northern Pennsylvania; length, 30 miles; capital, $250,000. President, C. L. Pattison, Elkland, Pa. Directors, C. L. Pattison, R. H. Wombaugh, J. W. Hammond, G. Roberts, J. Horton, T. C. Platt, W. C. Sheldon, G. R. Blanchard, J. E. Jones, F. A. Sears, R. G. Taylor, July 12.

Chester Street R.Co.; length, 4 miles; capital, $50-000. President, R. Peters, Jr., South Chester, Pa. Directors, R. Peters, Jr., W. Appleby, J. N. Tramer, F. W. Thomas, T. J. Houston, H. Shaw, J. F. Black, S. A. Dwyer, W. S. Blakeley, R. Weterhill, G. B. Lindsay. July 13.

Pine Creek & Tioga Valley; length, 36 miles; capital, $250,000. President, G. H. Bush, Westfield, Mass. Directors, A. N. Cole, J. H. Seekreg, A. D. Tingley, E. W. Eaton, C. E. Burt, W. Dent, P. Bingham, A. F. Allen. July 13.

Easton & Martins Creek; length, 8 miles; capital, $100,000. President, F. Reeder, Easton, Pa. Directors, J. J. Detwiller, C. S. Colbert, H. J. Reeder, H. A. Sage, J. L. Wilson, F. Reeder. July 29.

Bradford & Garfield Air Line; length, 25 miles; capital, $250,000. President, C. S. Bushnell, New Haven, Ct. Directors, A. N. Cole, A. D. Tingley, G. H. Bush, N. Bushnell, J. M. Fuller, T. J. Melvin, A. I. Wilcox, F. E. Boden. July 31.

Susquehanna & Southwestern; length, 100 miles; capital, $4,000,000. President, W. A. Wallace, Clearfield, Pa. Directors, J. G. Reading, S. R. Peale, J. M. Gazzam, W. H. Brown, J. M. Adams, B. L. Wallace. Aug. 12.

Sheffield & Tionesta; length, 15 miles; capital, $200,000. President, R. P. Crafts, Holyoke, Mass. Directors, G. Bush, A. N. Cole, J. R. Rand, A. I. Wilcox, J. M. Fuller, T. J. Melvin, N. Bushnell, H. A. Page. Aug. 23.

Bradford & Oil City Air Line; length, 15 miles; capital, $200,000. President, G. H. Bush, Westfield, Mass. Directors, D. D. Warren, R. P. Crafts, A. D. Tingley, A. I. Wilcox, J. M. Fuller, T. J. Melvin, N. Bushnell, H. A. Page. Aug. 23.

Fifth Avenue & Park Place; length, 6 miles; capital, $150,000. President, T. Faucett, Pittsburgh. Directors, E. House, T. H. Phelps, R. Q. Whitten, W. C. Moreland, J. S. Speer, G. R. Stewart. Aug. 23.

Tionesta Central; length, 15 miles; capital, $200,-000. President, J. R. Rand, New York. Directors, R. P. Crafts, G. H. Bush, A. N. Cole, A. I. Wilcox, J. M. Fuller, T. J. Melvin. H. A. Page, N. Bushnell. Aug. 23.

Oil City & Tionesta; length, 15 miles; capital, $200,000. President, A. N. Cole, Wellsville, N. Y. Directors, G. H. Bush, R. P. Crafts, A. D. Tingley, H. A. Page, A. I. Wilcox, J. M. Fuller, T. J. Melvin, N. Bushnell. Aug. 23.

Bellefonte & Buffalo Run; length, 16 miles; capital, $200,000. President, E. Blanchard, Bellefonte. Directors, C. A. Mayer, W. W. Rankin, W. H. Blair, E. McCoy, J. D. Sugert, J. L. Kurtz. Sept. 21.

Philadelphia, Norristown & Phœnixville; length, 25 miles; capital, $1,000,000. President, J. N. DuBarry, Philadelphia. Directors, H. D. Welsh, E. Smith, J. P. Green, N. P. Shortridge, J. C. Witherill, S. Kneass. Sept. 20.

Phœnixville, Pottstown & Reading; length, 30 miles; capital $1,000,000. President, J. N. DuBarry, Philadelphia, Directors, H. D. Welsh, E. Smith, J. P. Green, N. P. Shortridge, J. P. Witherill, S. Kneass. Sept. 20.

Gettysburg & Harrisburg; length, 22 miles; capital, $250,000. President, J. C. Fuller, Philadelphia. Directors, J. Cooke, B. J. Woodwaid, J. M. Butler, J. Cooke, Jr., C. D. Barney, S. Ervin, Sept. 27.

Round Top; length, 3 miles; capital, $25,000 President, A. W. Eichelberg, Hanover. Directors, W. Grambine, R. Young, P. Flickinger, R. M. Wirt, R. A. Eichelberger, H. A. Young, D. Wills, H. D. Scott. Sept. 14.

Altoona & Allegheny Street; length, 4 miles; capital, $25,000. President, S. C. Baker, Altoona. Directors, S. C. Baker, J. B. Hileman, J. Louden, J. Lloyd, M. Alexander, T. H. Wigton, M. Kinkead. Sept. 30.

Swatara; length, 3 miles; capital $30,000. President, L. S. Bent, Steelton. Directors, L. S. Bent, L. D. Gilbert, E. F. Barker. Sept. 1.

New Castle, Plain Grove, & Butler; length, 25 miles; capital, $500,000. President, J. D. Clarke, Pittsburgh. Directors W. McMurray, W. A. Schmidt, J. E. H. Kelly, W. Bunton, T. F. Ashford, F. P. Smith. Sept. 9.

Monongahela; length, 4 miles; capital, $24,000. President, J. H. McCreery, Allegheny. Directors, J. A. Caughey, R. D. Elwood, J. D. Clarke, R. F. Ramsey, W. J. Crozier, G. Bilderback. Sept. 22.

Pittsburgh Central; length, 10 miles; capital, $300,000. President, R. Liddell, Pittsburgh. Directors, C. Meyran, J. H. McCreery, M. Hunter, W. C. Erskine, J. J. Speck, R. M. Kennedy, N. May, J. G. Robinson. Oct. 14.

Pittsburgh Belt; length, 6 miles: capital, $300,-000. President, E. K. Hyndman, Pittsburgh. Directors, W. VanKirk. J. W. Chalfant, J. Callery, R. Miller, W. Metcalf, H. W. Oliver, Jr., J. Painter, Jr., C. B. Herron, J. H. McCreery. Oct. 16.

Williamsport & State Line; length, 80 miles; capital, $2,600,000. President, R. A. Ford, Binghamton, N. Y. Directors, C. Strong, J. Anderson, E. Ross, R. A. Ford, R. H. Woolly, F. Coleman, J. Bradshaw, J. M. Heacock, D. T. Huckell, J. Evans, E. R. Payne, D. M. Peck. Nov. 6.

Erie & Wyoming Valley; length, 68 miles; capital, $3.000,000. President, E. M. Clymer, Reading. Directors, S. Hines, E. P. Darling, J. V. Darling, W. A. May, C. E. Bradbury, E. H. Ives, E. M. Clymer. Nov. 6.

New Castle Southern; length, 10 miles; capital, $100,000, President, J. S. Negley, Pittsburgh. Directors, J. S. Negley, D. H. Wallace, G. B. Berger, F. Holton, F. Hanning, Z. T. Allen, H. T. Hanna, A. G. Negley, C. F. Calhoun, J. S. Negley, Jr., M. C. Mengis, G. L. Reiber. Nov. 2.

Lackawanna; length, 25 miles; capital, $250,-000. President, H. M. Boies, Scranton, Directors, J. J. Albright, T. F. Torrey, D. N. Green, E. F. Torrey, H. Z. Russell, R. J. Menner. Nov. 13.

Gettysburg & Emmitsburg; length, 6 miles; capital, $60,000. President, A. W. Eichelberger, Hanover. Directors, W. Grambine, S. Keefer, R. M. Wirt, R. Young, P. Flickinger, H. A. Young, H. D. Scott, D. Wills. Nov. 10.

Pittsburgh & Whitehall; length, 7 miles; capital, $300,000. President, O. C. Phillips, Allegheny City. Directors, O. C. Phillips, R. B. Brown, C. L. Magee, C. W. Phillips, O. F. Wharton, W. Chess, G. T. Oliver, J. A. Chambers, A. M. Byers. Nov. 9.

Chartiers & Ohio Valley; length, 8 miles; capital, $150,000. President, M. D. Hays, Pittsburgh. Directors, W. J. Steen, T. MacConnell, Jr., R. L. McCully, W. J. Radcliffe, T. D. Streen, J. Reamer. Dec. 13.

New Castle & Western; length, 15 miles; capital, $150,000. President, J. S. Negley, Pittsburgh. Directors, J. S. Negley, F. W. Lockwood, T. P. Simpson, H. E. Collins, J. S. Robinson, J. S. Negley, Jr., F. Himmings, A. G. Negley, C. F. Calhoun. Dec. 13.

Cresson & Clearfield County & New York Short Route; length, 30 miles; capital, $1,500,000. President, J. Irwin, Hollidaysburg. Directors. A. S. Morrow, M. Bell, Jr., W. P. Smith, J. P. Stewart, J. C. Gates, F. A. Shoemaker, F. Jackel, W. C. Bayley. Dec. 19.

Mississippi.

Georgia Pacific; consolidation of the Elyton & Aberdeen, Columbus, Fayette & Decatur and Greenville, Columbus & Birmingham R's.; from Atlanta, Ga., to the Mississippi River, via either Columbus or Aberdeen. Feb. 15.

Yazoo & Mississippi Valley; through the Mississippi, Yazoo and Sunflower river basins west of the Chicago, St. Louis & New Orleans R., to connect said road with the Mississippi, via Yazoo City; capital, $5,000,000. Incorporators, R. C. Shepherd, F. Barkdale, J. Z. George, W. R. Pillow, F. A. Montgomery, G. W. Faison, J. Willis, R. P. Neely, W. H. H. Green, J. W. Sbields, W. H. Osborn, J. C. Clarke, W. K. Ackerman and others. Feb. 17.

Gulf & Ship Island; from Mississippi Sound to Jackson, Hinds County; capital, $2,500,000. Incorporators, W. Adams, S. Gwin, R. H. Allen, E. Barksdale, J. S. Hamilton, T. J. Stewart, J. A. Hoskins, G. C. McKee, J. J. Thornton, P. I. Montross. Feb. 23.

Alabama & Mississippi; from Alabama State line to the Mississippi River, via West Point and Walthall; capital, $50,000. Incorporators, J. C. Bonner, P. B. Dugan, J. E. Davis, T. C. White, F. Beall, R. C. Beckett, R. W. Tribble, J. W. Joiner, F. M. Howard. March 9.

Memphis & New Orleans R. & Levee Co.; from the north to the south boundary of the State west of the Chicago, St. Louis & New Orleans R.; capital, $10,000,000. Incorporators, T. Ewing, W. L. McMillan, C. P. Huntington, M. Green, M. Meriwether. March 8.

Helena, Sardis, Pontotoc & Birmingham; from a point opposite Helena, Ark., toward Birmingham, Ala., to the State line, via Sardis, Oxford and Pontotoc; capital 2 000 000. Incorporators, T. J. Jacks, W. E. Moore, J. C. Tappan, of Helena, and others. March 8.

Vicksburg & Mississippi; from Vicksburg northerly to the Tennessee line, with branch to the southern State line toward New Orleans. Incorporators, R. A. Hill, R. G. Hervey, of Evansville, Ind.; T. E. Crutcher, G. M. Cline, S. M. Shelton, of Vicksburg. March 9.

New Orleans, Baton Rouge, Vicksburg & Memphis Short Line; from Vicksburg toward Memphis to the State line, and toward New Orleans to the State line, with branch to Natchez; capital $5,250,-000. Incorporators, A. R. Shaw, P. Willoughby, L. G. Chapman, F. H. Brown, N. B. Norwood, F. O. Brown, T. A. Moore, B. F. Morris. March 9.

Mississippi & Arkansas; from Grenada to a point opposite Helena, Ark., with branch to the north State line west of the Mississippi & Tennessee R., and also a branch to a point opposite Arkansas City. Incorporators, R. P. Lake, J. B. Perkins, C. Perkins, J. C. Griffing, H. T. Coffee, C. B. Vance, J. Powell, F. C. Morehead. March 9.

Meridian, Winona & Helena; from Meridian to a point opposite Helena, Ark.; capital $3,000,000. Incorporators, J. Watkins, T. Kincannon, F. H. Sanders, J. J. Stockard, R. W. Banks, H. M. Street, J. E. Simmons, L. A. Rigsdale, and others. March 9.

Mississippi Mexican Gulf; from the Gulf of Mexico through Harrison County to the New Orleans & Northeastern R.; capital, $50.000. Incorporators, R. Seal, T. J. Stewart, J. T. Liddle, W. B. Haywood, A. J. Ramsey, J. J. Thornton, F. W. Elmer, A. K. Northrop, and others. March 8.

Mississippi, Alabama & Georgia; from Natchez eastwardly to the Alabama line; capital, $750,000. Incorporators, A. H. Brenham, S. Ullman, H. C. Griffin, T. L. Mellen, W. T. Martin, J. W. Lambert, A. H. Foster, J. A. Dicks. March 9.

Tennessee & Mississippi River; from some point on the Mississippi toward Oxford and Corinth to Evansville, Ind.; capital, $10.000,000. Incorporators, A. M. West, W. M. Inge, C. B. Howry, R. C. Cates, R. H. Allen, F. H. Sanders, R. P. Neely, H. C. Davis. March 7.

Canton, Aberdeen, Fulton & Nashville; from Kosciusko, or Canton, via Starkville, West Point and Aberdeen toward Nashville and Chattanooga; capital, $5,000,000. Incorporators, L. E. Houston, T. P. Sykes, J. Gatman, F. M. Abbott, P. R. Dugan, H. L. Muldrow, W. K. Ackerman and others. February 17.

Vicksburg, Canton & Yazoo City (change of name to the Vicksburg & Northeastern); from the Tennessee State line to the Alabama line. March 7.

Richmond & Danville Extension Co., of New Jersey. Incorporators, W. P. Clyde, G. W. Perkins, T. M. Logan, G. Zabriskie, H. W. Perkins. March 4.

Birmingham & Northwestern, of Alabama; from the Alabama line to Corinth.

Meridian, Brookhaven & Natchez; from Meridian to Natchez; capital, $3,000,000. Incorporators, J. W. Fewell, J. B. Chrisman, R. L. Henderson, J. A. Hoskins, F. Stanton and others. March 7.

Georgia.

Tennessee & Cohuttah; length, 3 miles; from East Tennessee, Virginia & Georgia R. to the State line. May 18.

East Georgia & Florida; length, 50 miles; from or near Buffalo, Glynn County, to St. Marys, Camden County. June 8.

Logansville; length 10 or 11 miles; from Logansville to Lawrenceville, in Gwinnett County. July 5.

Savannah & Pacific; length, 250 miles; from Savannah to or near Columbus, Ga. Sept. 9.

Augusta & Elberton; length, 75 miles; from Augusta to Elberton. Oct. 2.

Savannah & Tybee; length 18 miles; from Savannah to Tybee Island.

Metropolitan Street; Atlanta. November.

Southside Street; Atlanta. November.

South Carolina.

Carolina, Cumberland Gap & Chicago. President, W. H. Scofield, New York; vice-president, O. C. King, Tennessee; executive committee, W. H. Scofield, J. W. Deford, O. C. King, C. G. Patterson; secretary, S. L. Campbell, Aiken. This is the only road that has filed its acceptance of charter and elected officers.

Following are those that have been chartered:

Bishopville.

Barnwell.

Berkeley County Railway & Lumber Company.

Palmetto.

Spartanburg, Aiken & Port Royal.

Mt. Pleasant, Sumter & Little River.

Greenville & Port Royal.

Union, Gaffney City & Rutherfordton.

Marion, Marlboro & Horry.

Following is the construction reported:

Chester & Lenoir—Lincolnton, N. C., to Mayden, N. C., 9 miles. Central—Lanes, S. C., to Sumter, S. C., 40 miles. Augusta & Knoxville—From near Modoc, S. C., to Greenwood, S. C., 38 miles. Total, 78 miles in South Carolina; 9 miles in North Carolina.

Virginia.

Norfolk & Sewell's Point; name changed to Norfolk & Virginia R. R. & Improvement Co.

Saltville & Coal Mine; name changed to Norfolk & Cincinnati R. R. Co.; corporators, A. H. Bronson, E. C. Hoag, D. M. Lowrey, W. G. Clark, Philadelphia; W. B. Aston, Russell County, Va.; F. M. Imboden, W. K. Armistead, A. T. Starrett, Saltville, Va.

Henrico; commissioners, S. Ward, A. McCulloh, A. B. Thacker, T. Saligman, C. E. Belvin, J. T. Jones, J. H. Rose; office, Richmond, Va.

Richmond & Southwestern; name changed to Richmond & Louisville.

Bristol Coal & Iron Narrow Gauge; name changed to South Atlantic & Ohio River R. R. Co.; office, Bristol, Tenn.

Iron Belt; commissioners, W. N. Johnson, J. W. Robinson, R. H. Adams, C. A. de Russy, H. Waterman, J. E. Eskridge, R. Sayers, P. G. Hall, J. L. Radford, R. P. Gilham; W. Frazier, E. Dilton, G. C. Wharton.

Virginia Mineral & Gypsum; name changed to Virginia Iron Trunk R. Co.; corporators, G. B. Board, J. J. Moorman, D. B. Strouse, R. L. Bowen, T. J. Higginbothan, J. Stras, W. H. Burns, C. A. Smith, G. C. Gose, J. H. Dickenson, T. W. Davis, S. H. Newberry, S. W. Williams, C. Payne, W. Eggleston, M. P. Farrier, M. Trouth, D. S. Read, J. Chalmers, E. McMahan, J. A. Watts, H. A. Edmundson, C. W. Burnell, W. R. Beale, F. J. Chapman, M. W. Pettigrew, R. H. Logan, J. C. Green.

Virginia & West Virginia; corporators, J. B. Davis, E. D. Christian, H. G. Davis, J. Sprigg, W. C. Clayton, A. Shell, S. B. Elkins, Henry Heaton.

Fauquier & Rappahannock; commissioners, J. Y. Menefee, M. Miller, J. T. Daniel, D. Gordon, J. T. Fletcher, W. W. Moffett, J. A. Browning, W. F. Anderson, H. S. Menefee, T. B. Massie, H. S. Fletcher, H. A. Wood, R. E. Miller, J. W. Fletcher, W. M. Mason, J. E. Yates, R. L. Menefee, P. H. O'Bannon; office, Washington, Va.

Allegheny Extension; corporators, F. O. French, J. J. McCook, J. W. Simpson, E. R. Leland, J. D. Janeway, W. M. Bonmonn, T. B. Brooks, J. Houdon, J. Walker, J. C. Drayton; office, Richmond, Va.

Lynchburg Street R. Co.; corporators, C. V. Winfree, C. W. Button, J. P. Bell, J. D. Holt, A. A. Tunstall, S. Adams, J. P. Shaner, J. Helbig, R. T. Craighill; office, Lynchburg, Va.

Massanutten & North Mountain; incorporators, J. D. Price, Harrisburg, Va.; T. J. Peter, Topeka, Kas.; C. S. Brice, Lima, O.; S. Thomas, Rockingham, Columbus, O.; J. S. Harnsbarger, Harrisonburg, Va.; J. Laose, Rockingham; H. C. Allen, Shenandoah; H. D. Gardner, Warrenton, Va.

James River & Blackwater R. & Lumber Co.; corporators, R. K. Turner, W. D. Turner, C. T. Mountcastle, J. S. Norsworthy.

Elizabeth City & Norfolk; name changed to Norfolk & Southern.

Farmville & Staunton River; corporators, R. S. Paulett, W. G. Dunnington, B. L. Anderson, C. M. Walker, W. W. H. Thackston, S. B. McKinney, R. M. Burton, P. Winston, W. P. Gilliam, A. R. Venable, G. W. Davis, J. M. Crute, J. P. Fitzgerald, J. L. White, H. R. Hooper, A. W. Dumellett, N. H. Champlin, B. S. Hooper, T. P. Robertson, F. N. Watkins, Farmville, Va.; J. E. Eggleston, J. M. Venable, C. H. Bliss, Sr., A. J. Price, D. Kemper, Prince Edward; R. H. Flournoy, J. W. Eggleston, W. T. Scott, M. M. Martin, W. R. Gams, Charlotte County; W. L. Lancaster, B. A. Wilson, Cumberland County; E. W. Hubard, J. B. Ficklin, J. V. Crete, R. A. Baldwin, J. A. Wright, Buckingham county; J. Booker, W. J. Johnson, R. T. Hubbard, J. W. Fisher, Richmond; H. S. Reynolds, Norfolk, Va.

Norfolk & Portsmouth Terminal Railway, Wharf & Warehouse Co.; name changed to the Consolidated Southern R. Co.

Manchester Railway & Land Improvement Co.; corporators, T. B. Brooks, A. S. Buford, C. C. McRae, J. P. Branch, J. Walker, W. G. Taylor, C. W. Turner, W. T. Clopton, J. R. Perdue, J. W. Dooly, G. K. Macon, W. F. Giddings, Manchester, Va.

Atlantic & Danville Narrow Gauge; commissioners, P. Fleetwood, J. S. Ellis, R. W. Arnold, J. W. Bailey, W. H. Turner, B. D. Tiller, B. F. Garrett, J. J. Deyer, Virginia; W. G. Shun, E. Dexter, J. P. Chaplin, F. Mills, S. H. Kimball, C. H. Knight, Boston; C. Roosevelt, New York.

Surry County R. & Lumber Co.; corporators, D. Steel, R. A. Cock, J. W. Ramey, J. J. Deyers, S. H. Burt.

Wisconsin.

Ashland; office, Hudson. President, E. W. Winters; vice president, J. C. Spooner; secretary and treasurer, C. W. Porter. Directors, E. W. Winters, W. H. Phipps, J. C. Spooner, C. W. Porter, D. B. Taylor. June 26.

Ashland, Montreal River & Ontonagon. President, S. S. Vaughn; vice president, S. S. Fifield; secretary, T. Bardon; treasurer, C. F. Bowen. Directors, S. S. Vaughn, S. S. Fifield, T. Bardon, N. D. Moore, W. M. Tomkins. Aug. 3.

Beaver Dam & Northwestern; office, Beaver Dam. President, H. W. Lander; secretary, B. F. Sherman; treasurer, T. Huth. Directors, H. W. Lander, B. F. Sherman, S. S. Rose, W. C. Griffis, T. Huth, G. B. Congdon, E. C. McFetridge, F. Sehrkind, M. Erwing. April 21.

Galesville & Mississippi River; office, Galesville. President, Albert Keep; vice-president, M. Hughitt; secretary, J. B. Redfield; treasurer, M. M. Kirkman. Directors, G. H. Smith, A. A. Arnold, G. G. Freeman, Isaac Clark, H. Birchard, A. H. Kneeland, D. Kennedy. April 6.

Milwaukee & Lake Winnebago; 65 miles constructed from Nenah to Schleisingerville. Directors, J. L. Colby, M. P. Jewitt, W. G. Fitch, W. Merrin, H. Morris. March 24.

Markesan & Brandon; 11.50 miles completed. Directors, J. Densimore, S. Barter, S. D. Goodell, G. W. Dart, W. Paddock, S. W. Mather, C. N. Holbrook, S. W. Smith, L. B. Phelps. August 9.

Saint Croix & Chippewa River; office, River Falls. President, O. S. Powell; secretary, J. B. Thayer; treasurer, J. M. Smith. Directors, D. McGregor, O. S. Powell, E. W. Jackson, J. M. Smith, R. S. Burhyte, C. H. Boxrud, J. B. Thayer, S. J. Oakley, J. D. Putnam. May 29.

Wisconsin, Pittsville & Superior; office, Dexterville. President, G. Hiles; vice-president, W. H. H. Cash; secretary, R. T. Lund; treasurer, L. Ward. Directors, G. Hiles, J. Hiles, L. Ward, S. H. Gould, W. H. H. Cash; general solicitor, C. W. Briggs. Sept. 2.

Wyoming.

Denver, Yellowstone & Pacific; office, Laramie City. Trustees, M. N. Grant, S. W. Downey, W. O. Downey, F. Wolcott, H. Wagner, D. C. Holcomb, O. Gramm, J. H. Symons, H. Groesbeck. April 15.

Dakota, Wyoming & Western; office, Cheyenne, Wy. T., and New York. Directors or trustees, W. J. Nichols, F. H. Smith, T. H. Wagstaff, A. Stevens, R. W. Kennedy, H. D. McKay, J. Halley. May 13.

CORRESPONDENCE.

CORRECTION.

VANDERBILT UNIVERSITY,
School of Engineeering,
NASHVILLE, Tenn., Feb. 14, 1883.

EDITOR ENGINEERING NEWS:

DEAR SIR: In my correction, in your issue of Jan. 27, of the errors in your abstract from my circular for finding the true meridian, you again misquote me. "3.5*m. for each year*" should be ".35*m. for each year.*"

I call attention to these errors in the interest of surveyors and others who may not see the circular itself and would therefore be misled by your abstract of it. Yours truly,

OLIN M. LANDRETH.

TESTS AND TESTING MACHINES.

PHŒNIXVILLE, PA., Feb. 8, 1883.

EDITOR ENGINEERING NEWS:

DEAR SIR: In reading the very able article of Mr. Theodore Cooper on "Tests and Testing Machines," which appeared in Vol. IX., No. 32, of your interesting paper, one cannot help being very much impressed with the great need in which engineers and manufacturers of iron stand of a careful, systematic method of recording the results of their experiments, so that there will be neither uncertainty attending the conditions under which the results were reached, nor ambiguity in interpreting the quality of the material from them.

In the paper referred to, the author carefully points out the uncertainty that attends work designed *entirely* from experiments upon small specimens, and strongly advocates the great need for further research into experiments upon *full-sized* specimens; a need which is felt by every engineer.

But, however, *small specimens*, where the experiments are carefully made, and everything that could possibly influence the strength of the specimen is recorded in a systematic manner, will give the designer a very close approximation of the quality of the material he is about to use. Every detail of the test that is not recorded materially lessens the value of the report to the designer, and therefore *all* should be carefully noted.

Formerly the ultimate, or breaking strength of experiments upon iron and steel, was all that was considered essential, but now this is merely one of the several qualities which constitute a report. Other properties have come into use which have enabled the designer not only to form an estimate of the ultimate strength of the metal, but also a close approximation of its toughness, ductility and elasticity. These properties are classified in reports under the well-known names of Percentage of Elongation, Reduction of Area and Elastic Limit. A report which does not specifically state the exact dimensions of the specimen, the length between marks on the specimen (which determines the percentage of elongation) and similar quantities, is of very little value in estimating the strength.

All these points are generally found in reports of carefully conducted tests, but there remains one which has not become general, although its necessity has been pointed out by many experimenters, and attention called to it. *It is a record of the length of time that the specimen has been subjected to strain.*

This is the point to which I wish to call specia attention, as experiments made without noting it are apt to lead to inaccuracies concerning the strength of the metal.

Allow me to quote a few sentences from "The Strength of Materials," by Wm. Kent, M. E., relative to this subject:

"Regard must be had to the *time* occupied in making tests of certain materials. When wrought iron and soft steel can be made to show a higher approximate strength by keeping them under strain for a great length of time, it is well to test them as rapidly as possible to obtain their minimum strength; and in accepting tests of these materials from interested parties it is well to know what length of time they have taken in testing them."

My attention was first called to this fact by the testing of two pieces of 1¾ in. round merchant iron at which I assisted. The specimens were cut from the same bar, and were in all respects similar. The first piece was broken quickly, and the ultimate strength, elongation and reduction of area recorded. The second piece was then placed in the machine, and besides the points above noted, the elastic limit was determined, consuming considerable time. This bar broke with an ultimate strength of 2,079 lbs. per square inch *higher than the first.* As care was taken to have the bars similar in all respects, the only thing that was noticeable in accounting for such a discrepancy was the time consumed in the two tests.

This being the case, ought not this element of *time* to appear in reports of tests as regularly as any of the other elements which constitute a successful report?

I have as yet failed to notice any reports of tests upon iron or steel in which this element has appeared, and would be very glad to hear from any of the readers of your paper who have used it.

Yours respectfully,

SAMUEL T. WAGNER.

WATER-WORKS FOR ROSCOMMON, MICH.—A system of water-works has been selected by the village board, and will be submitted to a vote of the electors at the coming village election on second Tuesday in March, and, if carried, the system will be immediately introduced. The estimate of the board of cost of these works, for fire protection and for furnishing all who may need water, is $7,000. The plan is to let the contract to Flint, Walling & Co., of Indiana, to erect a large tank, capable of holding 1,100 barrels, at an elevation of 40 feet above the base, erected on an elevation, with a large wind-mill with a 10-foot stroke, and a pump to get the water into this tank, located close to a large stream (Robinson Creek), the stream and tank being connected by a pipe. Pipe ranging from 3 to 6 inches in diameter will be laid along the principal streets, at a depth below the surface sufficient to insure the water from frost. Hydrants will be located at every corner of a street where it is deemed necessary for protection. About 1,000 feet of hose will be bought, with three hose wagons. An office will be erected for a council room, using the lower part for a hose house. As the liquor tax amounts to about $3,300 per year, it is thought this outlay can be met and liquidated from this fund, without any further tax on the people.

ENGINEERING NEWS
AND
AMERICAN CONTRACT JOURNAL.

Tribune Building, New York City.

The Engineering News Publishing Company, Proprietor.
GEO. H. FROST, Treasurer.

SATURDAY, FEBRUARY 24, 1883.

EDITORIAL ANNOUNCEMENTS.

Terms of Subscription.—To the United States and Canada, $4 per annum, including postage; all parts of Europe and Mexico, $5, payable in advance. Remittances at the risk of the subscriber, unless made by registered letter or by draft, check or P. O. order, payable to GEO. H. FROST.

Terms of Advertising.—One inch, 12 lines, one insertion, $2; one month, $6.50; three months, $17; six months $30; one year, $50. Special rate for large space and long time will be given on application. Advertisements inserted for less than three months, payable in advance; for longer time, payable quarterly.

Articles for Publication in the current number should be received at the office of publication not later than Thursday morning, and advertisements not later than Friday noon.

Correspondence upon subjects which naturally belong to the province of this journal is solicited.

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NOTICES OF MEETINGS.

AMERICAN WATER-WORKS ASSOCIATION.—President, Col. J. T. Foster, Union Stock Yards, Chicago, Ill.; Secretary, J. H. Decker, Hannibal, Missouri; Treasurer, Horatio D. Wood, S. W. corner Fifth and Olive sts., St. Louis, Mo. Vice-Presidents: J. G. Briggs, Terre Haute, Ind.; J. James R. Croes, New York City, N. Y.; W. C. Stripe, Keokuk, Iowa; Thos. J. Bell, Cincinnati, O.; Edwin Darling, Pawtucket, R. I. The third annual meeting will be held at Buffalo, N. Y., May 15, 16 and 17, 1883.

OFFICIAL NOTICE.

AMERICAN WATER-WORKS ASSOCIATION,
SECRETARY'S OFFICE, HANNIBAL, MO., Feb. 1, 1883.

The Executive Committee, believing it to be for the best interest of the association, have postponed the annual meeting from March until the third Tuesday of May. *The third annual meeting* will therefore be held at Buffalo, N. Y., May 15, 16 and 17, prior to which time due notice will be given of the place of meeting, hotel arrangements, etc.

It is hoped that those to whom topics were assigned may profit by the extension of time and have their papers prepared.

The association has during the past two years very largely increased in interest and membership, and much is expected from the coming meeting.

Those of the water-works fraternity who have not yet attended our meetings are cordially asked to do so. The Secretary will at any time receive applications for and issue certificates of membership.

The proceedings of the first and second annual meetings of the association may be had on application to the Secretary.

It is hoped that this change may meet the approval of all and that it may be shown by a large attendance at Buffalo, where a warm welcome is offered, and, in addition, an excursion to Niagara Falls is promised.

By order of the Executive Committee,
J. H. DECKER, Secretary.

TOPICS FOR DISCUSSION AT NEXT MEETING.

Smoke Consumption. Ira A. Holly.
Economy of Constant vs. Intermittent Pumping. W. C. Stripe.
Methods of Filtration. J. Jas. R. Croes.
Economy: Municipal vs. Private Management. J. G. Briggs.
Plumbing: Its Sanitary Effects. Peter Milne, Jr.
Hydraulic Elevators and Motors. B. F. Jones.
Subsidence and Filtration of Western Rivers. G. W. Pearsons.
Use of Iron or Steel Tanks. Thos. J. Bell.
Systematic Compilation of Annual Reports. J. T. Foster.
Records of Engine Duty. Frank W. Holly.
Determination of Flow of Water through Mains in Use. Geo. A. Ellis.
Importance of Engine Duty vs. General Economy. Chas. A. Smith.
Repairs to Pumps and Machinery. Thos. J. Whitman.

No. 3, Vol. III. of the "Proceedings of the Engineer's club of Philadelphia" is received. It contains among other papers one on the "Most Economical Height of Bridge Trusses," by T. M. Cleemann, and an illustrated article on the construction of "The Kinzua Viaduct," by Howard Constable. Mr. C. W. Pusey gives an account of the trial trip of the "Twin Screw Steamer 'Victoria'," fully describing her build and equipments. Under the heading of "Notes and Communications" is an account of the building of the piers of the old Market street bridge in Philadelphia; this was the great engineering feat of the time (1800) on American soil, one of the piers being founded in water 41 ft. deep. The Wernwag bridge over the Delaware River at New Hope is also described.

KNIGHT'S NEW MECHANICAL DICTIONARY.—Section 3 of Knight's New Mechanical Dictionary has just been received from the publishers, Messrs. Houghton, Mifflin & Co. This number has been delayed somewhat in consequence of the death of the author at Bellfontaine, O., on January 22 last, but we are informed that Mr. Knight had completed his manuscript before his decease; and the only delay in issuing the final section will be that due the necessity of reading proof without his assistance.

Section 3 is as deserving of praise as its predecessors, and in contents is carried in alphabetical order to the "printing press." We notice that the illustrations are much improved in appearance, and the only adverse criticisms we would make in reviewing Nos. 1 and 2 will not apply to No. 3. We can make no selections for especial mention in looking over this admirable work; we can only wonder at the patient, persevering research and the untiring labor of the author, who has covered so completely the vast field of knowledge contained within the pages of this American Mechanical Dictionary.

THE CHANNEL TUNNEL.—A general meeting of the Channel Tunnel Company was held in London on the 31st ult., to consider the bill which had been deposited by the company. The chairman stated that he believed the scheme would merit the approval of Parliament and of the military and other authorities of the country. In order to meet the chief objection brought by the commissioners, the engineers had located the entrance to the tunnel so far inland as to secure it from the fire of ships. The entrance would be three and one-half miles from the end of the pier at Dover. There was one point that it was impossible to meet, namely, that the tunnel should be thoroughly and entirely blocked by an explosion that should open up direct communication between the sea and the tunnel. It was stated that the thickness of the chalk between the sea and the tunnel was so great that the powers we now possessed were inadequate to effecting an explosion which could cause a direct communication. The company is prepared to consider every reasonable proposition of the government looking toward rendering the tunnel secure. The chairman believed that before the work is completed it would be recognized by the world as of such importance as to hold it free in case of war. A war with France was the only one that would endanger the country through the tunnel and in event of war with other countries food supplies could be taken through from France, if other sources were stopped. At the close of the chairman's remarks the bill was approved and the directors were instructed to proceed with the same, subject to such alterations, additions and variations as Parliament may deem proper.

THE MANCHESTER (ENG.) SHIP CANAL.—The project of making Manchester a sea port, by means of a ship canal fifty miles long, is being taken up with great enthusiasm by the local authorities, the Chamber of Commerce, etc., and the scheme has the support of men of capital, land owners and manufacturers. It will be naturally opposed, however, by the several great railway companies, and the Mersey Harbor and Dock Board of Liverpool.

The plan is to deepen the channel of the rivers Mersey and Irwell, where they occupy the required site, and to provide a new channel by straightening these rivers where deemed advisable. The ordinary water level of the Irwell at Manchester being 60 ft. above the sea, three sets of locks will be required, but the sea level will be reached at Warrington, 18 miles below Manchester. The canalized portion of the river will have a bottom width of 100 ft., with a depth of 26 ft. The tidal portion below Runcorn, which is at the head of the Estuary of the Mersey, will be 24 ft. deep at low tide. The principal dock at Manchester is to have an area of 70 acres, and will be entered by gates 80 ft. wide. The estimated cost of the execution of the scheme is £5,400,000. Mr. E. Leader Williams is the Engineer.

One of the novel features of the plan is the passing of the point, near Manchester, where the Duke of Bridgewater's Canal is carried over the River Irwell by an aqueduct. It is proposed to substitute a new aqueduct, in which the central portion shall be an iron caisson kept full of water, and so constructed and supported upon a pivot pier that it can be swung open like a drawbridge. The potent reason given by the promoters of the scheme is the great tax at present imposed by the railways for the carriage of raw material and finished goods between Manchester and Liverpool. They believe the canal will pay. How they will settle with the four railroads which pass over the proposed canal remains to be seen.

"THE RAILROAD ENGINEERS' PRACTICE, being a short but complete description of the duties of the young engineer, in preliminary and location surveys, and in construction," by Thos. M. Cleemann A. M., C. E. The second edition of the above work, thoroughly revised and much enlarged, has just appeared. The errors which unfortunately crept into the first edition have been corrected, and all the illustrations much improved by substituting neat wood-cuts for the previously used photo-electrotypes.

The rapid absorption of the first edition, is proof sufficient that Mr. Cleemann, in the production of a work on the "practice" of railroad engineers, has met a want, long felt; and thus encouraged, he has added much valuable data in his later work. As expressed in the title, this book is especially intended for the young engineer just starting out in his profession; but it also contains material that will be useful to him who has had very considerable experience. We can safely say that no other single hand-book covers the field occupied by the author in his new edition, and the portion devoted to party organization and the individual duty of the members of a corps, is entirely new, and contains just the kind of information the beginner or newly appointed chief of party most needs.

Among other new matter, we notice a list of articles required for "camping out" in preliminary and location surveys. This inventory is given as the result of long experience, and embraces a most miscellaneous assortment of articles, the use of which we can recognize when set before us; but it at the same time shows what a puzzling task the chief of party has assigned him who, without extensive personal experience, is suddenly called upon to determine the nature of his "outfit;" to him, this list would be a boon indeed.

The "engineering problems" are selected with care, as being those which the transitman is most likely to meet with in practice, and the simplest in form of expression. Mr. Cleemann gives full directions for staking-out work, providing the proper water-way for culverts, designing arches and arch-centering, the measurement of bridge spans, under both simple and complicated conditions, the design and construction of the "road-bed," etc.

A very considerable part of the present work is devoted to bridge construction, giving methods of strain determination, from a simple beam to the trusses of most frequent use. Specifications for iron work, valuable hints as to choice of forms, construction data, etc., make this portion of the book most useful.

Foundations, masonry, "contractor's tricks" trestle-work, pile-driving, and the multitude of items that make up an engineer's daily life, are treated upon, the authorities given, and special cases noted as examples.

Under the general heading of "Road-bed," the question of setting out frogs, switches and cross-

ings is very fully discussed, and in the case of crossings a bill of lumber is given of the number and length of ties required.

THE INDUSTRIAL SITUATION.

The passage of the tariff bill by the Senate though extremely unwelcome in its details to the industrial interest of the country is one step in advance. The protectionists have failed to perfect their tariff bill in the House, and several days ago relinquished all hopes of doing anything on their own account and concluded to wait for the disposition of the Senate bill in order that they might amend it sufficiently to be acceptable to both sides. A vigorous effort will be made to bring tariff legislation to a close. Very little more speech-making is expected and certainly there is occasion for none. The subject has been exhausted so far as mere talk is concerned, and there is now no room left but for action. It is only a question of low duties, high duties, or moderate duties. A very bitter contest has been fought beneath the surface and both sides at present writing are still bringing to bear every possible fact and figure to secure a result favorable to their special interests. Quite a large element in manufacturing interests favor the delay of the whole matter until the incoming Congress next winter, but an effort will be made to secure the desired amendments to the Senate bill, which it is hoped will be accepted through the medium of a conference committee to be appointed. The iron and steel industry is in a condition of unrest and prices are fluctuating in every department. Consumption has been largely restricted in consequence of the uncertainty of tariff duties and prices. Projects contemplated late last year are held in abeyance and nothing will be done in the way of an enlargement of operations until builders and contractors can figure down cost of material. Prices of iron and its products have declined to a lower point than have prevailed since the panic of 1873. During the fall and winter they exhibited an upward tendency and many leading manufacturers anticipated that the movement would continue throughout the present year. This, however, was a dream never to be realized because the expansion of productive capacity during the past two years has been so great that it was only a question of time when productive capacity would exceed requirements. That time seems to have been already reached and it will be as much as the trade can do to prevent the development of a downward tendency. Nothing but a very rapid expansion of consumptive requirements will prevent such a result, and nothing but a very full employment of the productive agencies of the country will maintain the present demand. Should unfavorable influences result in a partial disemployment of labor and obstruction of railway building low prices will follow and confidence will be weakened. Very much depends upon the probable degree of railway construction this year. High authority states that fewer new roads will be commenced and that the bulk of construction will refer to the completion of existing lines. Differences of opinion exist on this point. A great amount of mileage has been projected and will be constructed unless some influences not at present apparent develop themselves. Four of the fourteen Bessemer mills are idle and six of the ten have orders on hand to keep them busy six months. Eastern mills are doing well, and the Western mills are bad off for orders. The reduction from $28 per ton to $15 duty will hurt the West more than the East, because of the easy delivery of foreign rails at Gulf ports, which can be carried a certain distance inland before being met by the products of Western mills. Quotations in small lots are now $40. But larger lots could be placed in Eastern mills at $39, and probably at less. Cost of production permits but very little competition. As long as the four mills remain idle, prices will remain where they are, but when these mills compete for trade, if they should, it will complicate the situation. Large purchases of ore lands have been made in the Southern States by the Bessemer companies, partly for the purpose of securing ore supplies and partly for the purpose of preventing others from securing possession of desirable properties. The ore question is still an unsettled one. The lake Superior companies refuse to make concessions asked for by consumers, and in consequence contracts are not being placed. New ore lands are being opened in other localities, some of which promise to increase the supply of desirable ores and ultimately lessen prices; but for the present year, the Lake ore companies seem to have an advantage which they will fully use.

The rolling mills throughout the United States are nearly all profitably engaged, but very few of them have more than a month's orders on hand. This is due to two causes, first, to the lack of consumptive requirements; second, to the fear of consumers that the agitations surrounding the trade will depress prices further. Quotations run from 2 cents to 2½, according to location of mill. The productive capacity is very large and can meet any probable demand, hence an upward tendency is very improbable. Several mills have recently got into trouble and this is evidence that a good many more are not far removed from it. It is probable that during the course of the year a few mills erected or operated without sufficient regard to cost of production and demand will find themselves obliged to suspend or reduce output to minimum limits. A great deal is said in class newspapers as to the invasion of steel in the domain of iron and of the probability that ultimately iron will find itself driven to the wall; supplanted by steel. There is a great deal of truth in these statements, but the invasion will be made gradually so that the interests concerned will be able to adapt themselves to the changing situations without serious loss. Iron rails have been driven out, it might be said absolutely, and steel rails are now sold $7 per ton less than iron rails commanded a year ago. Steel machine-made iron will in like manner soon drive out puddled iron and be sold at much less cost, some enthusiasts putting it at one cent per pound. While not indorsing these extreme statements, it is not at all improbable that wrought iron will ultimately be made near that figure. The declining tendency will stimulate demand, and thus maintain an increasing productive capacity. A careful review of the railroad situation shows briefly as follows, that nearly all the roads are earning fair dividends, that traffic will likely steadily increase, that large projects are still seriously contemplated, and that construction will be continued with something like the activity of last year.

These are certainly very favorable conditions to underlie the railroad situation, and they promise a fair degree of activity in all dependentindustries.

Complaint still is made of locomotive and transportation capacity. Cars are scarce in some of the coal fields. All of the coal fields have less to do than a few weeks ago. Tariff agitation has been a serious hindrance to trade in a great many directions. Car making is being vigorously prosecuted and all works are fully engaged for some months to come. Foundry capacity is only partially employed, but full capacity is anticipated at the opening of spring trade. The general industrial situation is satisfactory, casting aside the unsettling influences of tariff agitation. This agitation, which is so much feared by industrial interests, while apparently bringing some disadvantages in the way of greater competition and reduced profits, is accompanied by ultimate advantages to the general interests and an expanding demand, which will go far to compensate manufacturing interests for apparent losses.

THE FIGURE OF THE EARTH.

The recently published report of General Comstock on the primary triangulation of the Lake Survey reminds us that our geodetic surveys are rapidly accumulating valuable material for the discussion of the interesting problem of determining the size and shape of the earth. American astronomy has long been regarded with respect by the European savants, and next to it in pure science, American geodesy seems likely to secure a place. Our methods of land and railroad surveying are in many respects yet lacking in scientific precision, but in geodesy our work has been done with an accuracy fully equal to that of the European nations. Incidental to all geodetic surveys is the discussion of the figure or shape of the earth for upon its size and shape all calculations must be based. With this end in view, several arcs of meridians have already been measured in this country.

About 1768 Mason and Dixon, two astronomers who were running boundaries for William Penn, measured a meridian arc along the line that now divides the States of Maryland and Delaware. Its length is only about a degree and a half, and it is not now regarded as of sufficient accuracy to be taken into account in comparison with modern measures.

The U. S. Coast Survey has deduced two meridian arcs from its primary triangulation, one of nearly 3° 23′ along the coast of New England, and the other of nearly 4° 32′ along the coast of Virginia and North Carolina. A discussion of the shape of the earth resulting from these two measurements, given in the report for 1877, brings out the interesting fact that its size as determined by Bessel seems to be too small, and that it will be necessary, in order to secure the best results, to adopt the dimensions deduced by Clarke.

The report of General Comstock gives a detailed account of an arc of the meridian extending from the northernmost extremity of Lake Superior southward to Parkersburg in Illinois. The amplitude of the arc is 10° 12′ 35.45″, its length 1,133,-843.27 meters and it has fourteen latitude stations. There is also given the results for an arc of the parallel of 42 degrees, which extends over nearly 12 degrees of longitude. The Lake Survey has always used the Clarke spheroid in its geodetic calculations.

Local deviations of the plumb bob, causing differences between astronomical and geodetic latitudes and between observed and computed longitudes, have long been recognized in the Coast Survey and on the northern boundary work. An account of these deviations for a large number of points is given in the Lake Survey report, the largest in latitude being about 11 seconds and in longitude 14 seconds. The Coast Survey report for 1879 contains also an investigation concerning these deviations along the Atlantic coast. Explanations of these anamolies by the presence of mountain chains are not sufficient, but we are forced to conclude that the crust of the earth is of varying density. By means of the records of these deviations we gain every year a better idea of the actual, or geoidal, figure of the earth.

BOSTON'S WATER SUPPLY.

The special commission appointed last September to investigate the condition of the water supply of Boston has made its report.

They first state that owing to the varying flow of the Sudbury River, the water must be stored from early spring until summer, and to this fact much of the trouble is due. The shallowness of parts of the basins is the cause of the presence of algæ. In reference to the spongilla or the fishy taste and the presence of more organic matter than is proper in drinking water, they say that for the first there is but one remedy, the absolute cutting off of the infected supply, which will purify itself in time. This means the construction of a conduit around or across Farm Pond, and the increase of available resources by increase of supply, or decrease of consumption, the latter being the most economical. They recommend the thorough cleaning of the two conduits each year, as the spongilla grows in great quantities upon their walls.

Prof. Wood, chemist for the commission, has shown by careful analysis, that there is excessive organic vegetable matter in the Sudbury water, and instead of losing this by deposition and oxidation, it actually takes it up; it loses some in the Chestnut Hill Reservoir, but still contains too much

in Boston. This evil can only be thoroughly remedied by the removal of all loam from the basins, and allowing the water to stand until purified.

The commissioners sum up their recommendations in regard to the Sudbury supply as follows:

1. A conduit should be built across Farm Pond.

2. The aqueduct to Boston to be thoroughly cleaned each year.

3. The basins to be deepened around the edges, no flowage of less than 8 ft. tolerated, and all loam removed from this part of the bottom.

4. Measures to be taken at once to reduce the consumption.

With these precautions, the commisoners believe the Sudbury supply can be made sufficiently healthy and satisfactory, though it will probably always retain a slight color.

In regard to the Cochituate supply, the sewage contamination to which the lake is exposed demands immediate action. They believe the city authorities should prevent and punish all such pollution. If they have not the power, it should be obtained from the Legislature.

They recommend for the Cochituate supply:

1. To abandon all shallow flowage of less than 8 ft., and to remove the loam from this portion.

2. To thoroughly clean the Cochituate aqueduct every year—to remove the spongilla.

3. To prosecute without delay the people now polluting our supply.

PERSONAL.

Mr. CHARLES L. SCHLATTER is vice-president and consulting engineer of the Brunswick & Western Railroad. Headquarters at Brunswick, Ga.

LIEUTENANT-COMMANDER GORRINGE, who brought the obelisk to this city, will shortly resign from the navy to assume the management of a large iron ship-building yard in Philadelphia.

DR. J. W. DAWSON, Principal of McGill College, Montreal, has been elected one of the twenty honorary members of the Philosophical Society of Glasgow, Scotland.

SPECIFICATIONS

RELATING TO EXCAVATIONS IN THE CUT-OFF SHIP CHANNEL LEADING TO THE PORT OF BALTIMORE.

1. CONDITIONS OF BIDDING.—The amount of work to be let is about five hundred thousand cubic yards. Bids may be made for lots of one hundred thousand cubic yards or for the whole quantity. The work must be commenced promptly after the contract is awarded, but the contractor will be allowed until December 31, 1883, for its completion.

2. LOCATION OF WORK.—The excavations under these specifications will be made in the Cut-off Ship Channel, leaving the Brewerton Channel above Seven Foot Knoll Light-house, and joining the Craighill Channel below, or south of that light.

3. DEPTH OF CUTTING, ETC.—The dredging will be to a depth of twenty-seven feet at mean low water, and the depth of cutting will vary from about four feet to about fifteen feet,

4. MATERIAL.—Borings have been made at several points in the lines of the proposed excavations, and indicate that where depths of sixteen feet or less exist, the excavations will be through fine sand and shells, and in greater depths through soft mud and sand. The material to be excavated is represented to be as stated, but no allowance will be made should any of it prove to be of a different kind. Each bidder is expected to examine and decide for himself.

5. DUMPING.—The excavated material will be deposited at a point one mile east of the Craighill Channel, and not less than one mile south of the Brewerton Channel range. Average towage about three miles.

6. TIDES.—The tide rises about one and one-half feet.

7. MACHINERY.—All machinery to be used must be of approved make and in good repair. Scows must be sound and tight, and the whole apparatus maintained in sound working order at all times. The delay of six fair working days on the part of any contractor to perform the average daily amount of excavation guaranteed, shall, at the discretion of the engineer, subject the defaulting contractor to a forfeiture of his contract, and of all moneys remaining due and unpaid on account of work done under said contract.

8. MEASUREMENT.—The material excavated shall be deposited in scows or barges, whose capacity shall be determined by measurements made by the engineer in charge, or his agents, before work is commenced. The duty of determining when such scows or barges contain "full" loads shall devolve upon inspectors appointed by the engineer, and the decision of said inspector acting under orders of the engineer, as to the amount of material excavated and removed, as well as to its location and deposit, shall be final and without appeal on the part of the contractors.

9. METHOD OF WORKING.—The precise location of work to be done shall be fixed by the engineer in charge, or his assistants. The line shall be plainly marked by stakes and a register of tides provided by the engineer, and the contractor shall be responsible for the care and preservation of the lines, stakes and gauges. He shall pay for all loss or delay arising from the loss or injury of any of the said marks or gauges, occurring through the action of his employés or agents, and shall not be paid for any excavation done beyond the limits assigned him. An allowance of one foot in depth will be made for the unavoidable "filling in" behind the bucket, and all excavations below this depth, as well as any deficiency in the depth of twenty-seven feet as before mentioned, shall be deducted from the amount of excavation as allowed by count of "scow-loads." Said excess or deficiency shall be determined by examination made by the engineer or his assistants at suitable intervals behind each dredge. Furthermore, in the event of a deficiency in depth being found, the contractor shall, upon notification, redredge the bottom until the required depth is obtained.

10. The contractor will be required to furnish the board and lodging of the inspector for each dredge; the cost to be included in the price per cubic yard for dredging.

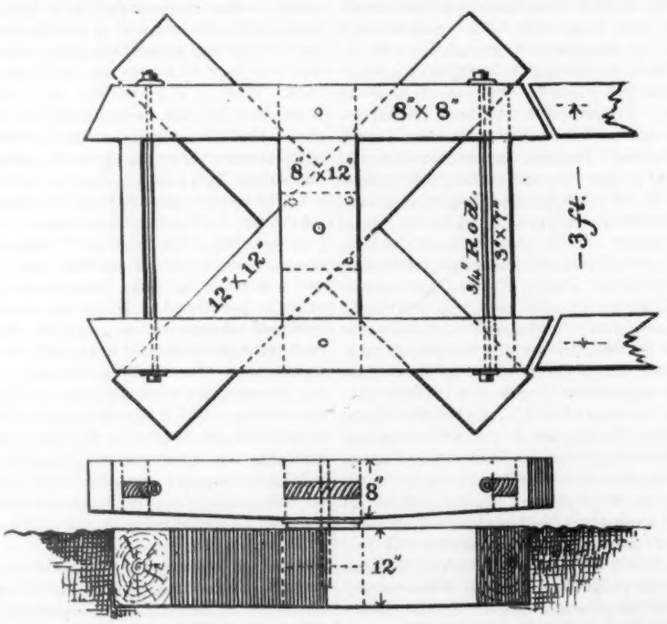
DEVICE OF RAISING COAL CARS.—Mr. C. B. Finley, of the Kittanning Coal Company, in the Clearfield region, has perfected a system of hauling coal out of the mines of the company, which appears to be both simple and inexpensive. He utilizes the switching locomotive used on the tracks outside of the mines as the motive power for drawing the loaded cars from the mine, instead of a stationary engine. The power is applied in the following manner: From the place where the trains are made up in the mine to the outside is some 1,200 feet. Under the track which extends between these two points is an endless wire rope, passing around a large drum at each end. To the drum on the outside is geared a large cog-wheel, which in turn is geared to four smaller wheels, which are so arranged under a side-track parallel to the main track that, when the locomotive is run on this side-track to the proper position, its four driving wheels are directly over and its weight is resting upon the four smaller wheels. Accordingly when the train of loaded cars, varying in number from twenty-five to forty, is made up at the bottom of the slope, the last car is clamped to the rope, the locomotive is run on the side-track outside and upon the friction wheels, and consequently the drum revolves, and the train moves up out of the mine. When it arrives at the surface, the locomotive is run off the siding, is attached to the train and performs its ordinary duties. One of the advantages of this arrangement over the stationary engine plan seems to be that, while the trains are making up in the bank the engine can be used for other purposes, at other places.—*Railway World.*

A WOODEN TURN-TABLE.

The wooden turn-table illustrated by full-page plan and details is one that can be used with economy and advantage wherever light cars and a track of narrow gauge are sufficient for the purpose intended, whether it is in the construction of public works, quarrying, or in handling coal. The dimensions given have stood the test of long usage, and the details are simple, but such modifications can be easily made as the service required may demand.

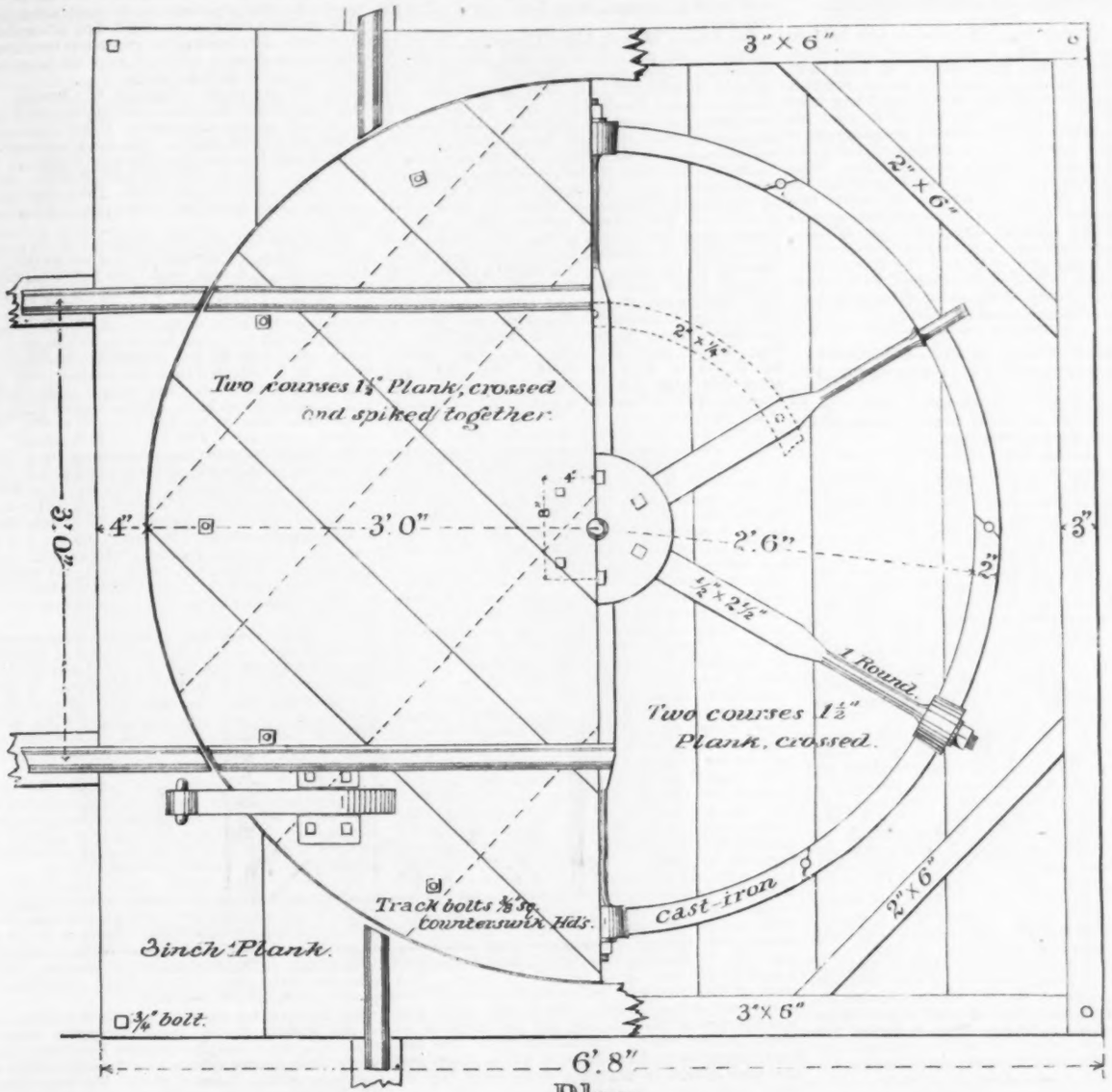
Four hundred feet B. M. of lumber will build the frame, table and floors, and any iron worker can furnish the metal parts, which are simple in design. We have shown in dotted lines, a wrought iron circle, 2"×¼" bolted to wheelarms; while some makers consider this unnecessary, it certainly adds to the stiffness of the spider-frame, and we would recommend its use. The dimensions are so fully given on the plan that little more description is necessary.

We also give a sketch of a still cheaper and more simple turn-table, which has been used advantageously in tunnel-work, with short-coupled dump-cars, of about ¾ cu. yd. capacity.

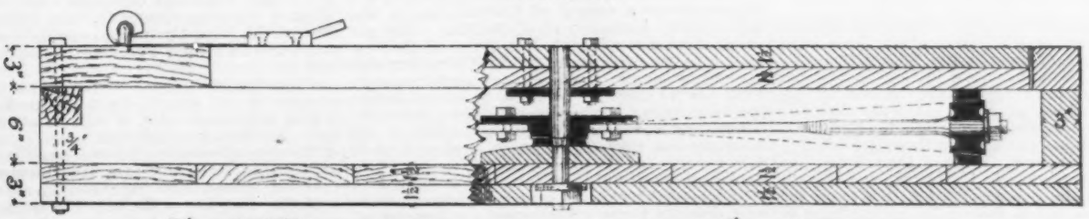


The base is made by crossing and halving two 12×12 in. sticks, about 6½ feet long, and burying the sticks, with the top flush with the surface of the ground; a plate of ½ inch iron, about 10 inches square, is spiked down on the "X," a hole for a 1½ in. pin being made in center of plate. The movable part of table is framed as shown on sketch, and held together by tie-rods; a plate, same as above, is spiked to bottom of center cross-piece. The center-pin can be secured by a collar under the bottom plate, or by a key driven through it; and the wrought-spikes used in securing the plates may have the heads countersunk in the plates, or made to pass clear of each other by slipping a couple of 6 in. wrought washers, of such thickness as the case may require, on the pin between the plates. To keep the tracks in line several simple methods would suggest themselves, but as such a turn-table is generally intended to turn but one way, two square stop-posts driven into the ground would be found sufficient.

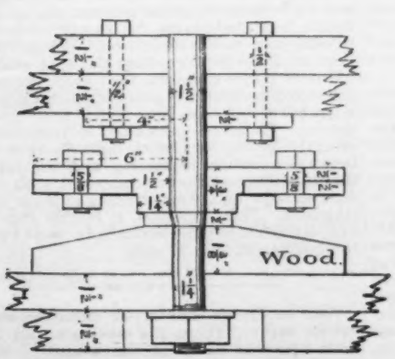
Another form of small turn-table is one in which the wheels are stationary, and work in cast-iron boxes, secured to the bottom floor; this form has but one track, that on the revolving table. We hope to soon give our readers this latter design as well.



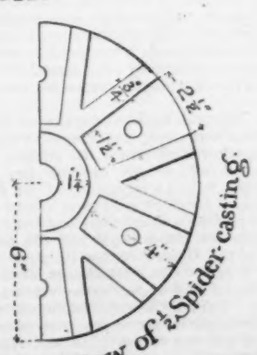
Plan.



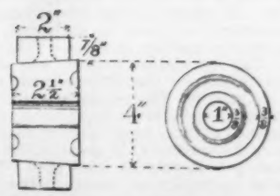
End Elevation. Section.



Centre Details.



Bot. view of ½ Spider-casting.



Wheel and Track.

Scale for General Plan.

0 1 foot. 2 feet.

Scale for Details.

1 foot.

WOODEN TURN-TABLE.

LIVERPOOL ENGINEERING SOCIETY.

The second meeting of the session was held on Wednesday, 31st ult., at the Royal Institution, Colquitt street, Mr. H. Brainall, M. Inst. C. E. President in the chair, when a paper, entitled "Graphical Investigation of Stresses," was read by Mr. H. T. Turner. The author divided his paper into three parts. Firstly, economy as a fundamental principle in designing. The desirability of simpler methods of calculation. The origin of "Graphic Statistics" applied to the investigation of framed structures. Secondly, the method applied to "Roof Trusses"—Description of Mr. Bow's system—Examples of Oblique Forces, etc.—Application to "Deficient Frames. Thirdly, Investigation of Stresses in Bridge Girders subject to rolling loads—Method by bending moments and shears—Accuracy attainable and comparison with analytical methods.

ENGINEERS' CLUB OF PHILADELPHIA

ROOMS, NO. 1523 CHESTNUT ST., PHILADELPHIA, Pa.

Record of regular meeting, Feb. 3, 1883.—President Henry G. Morris in the chair. Twenty-four members and one visitor present.

Mr. W. S. Auchincloss exhibited and described his latest forms of averaging machine, which consists of an endless platform, the grooves of which represent days or distances. The various weights, representing quantities or values, are placed in these grooves and the endless platform rotated until a balance of the weights is secured, when the exact answer may be read from the accompanying scale and, by then continuing the rotation, the weights fall upon an inclined plane, reach their respective compartments in front, and are again ready for immediate use. The machine is of special interest to the engineering profession in its application to the location of engines, boilers and coal-bunkers in steamers, the determination of diameters of pulleys, speed of shafting and average haul of material.

Mr. J. J. de Kinder described the United States metallic packing for piston rods, valve stems, pump rods and throttles—exhibiting sections and model; also model with packing it is intended to supersede. The metallic packing consists of eight composition blocks, held in a brass ring, on which are horns holding the springs which regulate the pressure of the block on the rod. It is said to preserve a steam tight joint without appreciable friction or binding. The vibration of the rod is provided for by a ball joint on one end and spring follower on other, which contrivance is said to give the packing free play and preserve its tightness, notwithstanding a vibration of the rod.

The Secretary announced the sudden death of Mr. William L. Billin, member of the club, and upon the motion of Mr. W. Bugbee Smith the President was requested to appoint a committee to prepare a memorial for publication in the proceedings.

HOWARD MURPHY, Secretary and Treasurer.

THE ELECTRIC LIGHT SPECULATIONS.

The stocks of electric light companies made their first appearance in Wall street about three years ago. The stock of the original Edison Company was the first that was dealt in, and it has sold at prices that have never been reached by any other. The shares of other companies speedily followed those of the Edison into the street. A most remarkable speculation in them immediately attended their advent. None of them have ever been listed by the Stock Exchange, and though most of them have been called in the room for dealing in unlisted securities, the transactions in them there have been small compared with the sales that have been made in the street. The sales have been negotiated or made through what are known as outside brokers, or brokers in unlisted securities. One or two of these brokers, notably Mr. A. J. Saportas, have made a specialty of dealing in electric light stocks. Mr. Saportas has followed the movement in these stocks from its inception, and has dealt more extensively in them than any other broker. The speculation started with a boom. Prices, particularly for the Edison stock, fluctuated widely and rapidly. The memorable bull speculation that then prevailed in the Stock Exchange, as well as outside of it, may have been partly responsible for the initial movement in electric light shares. The most potent reasons, however, were doubtless general ignorance or uncertainty about the true value of the inventions and discoveries then being made in electric lighting and the mystery with which those developments were surrounded. Since then the several companies have been demonstrating what they are capable of doing, and the subject of electric lighting has been studied and investigated till prices for these shares have gradually drifted to figures that doubtless approximate their intrinsic value.

In the following résumé of the market for electric light shares, the figures given are of sales that have been made through brokers. Both higher and lower prices may have been obtained at private sales.

The Edison Electric Light Company, the parent company and pioneer in the field, was originally organized with a capital of $300,000. This was increased to $460,000, and then to $720,000. The company owns about 51 per cent. of the stock of the Edison Illuminating Company, which was organized to use the Edison inventions in this city, and of the stock of the Edison Company for Isolated Lighting. The value of these holdings is taken into consideration in estimating the value of the shares of the parent company. When its capital was $300,000, its $100 shares sold as high as $3,700. Three shares sold at that price. The purchaser of these shares is reported to have sold them at private sale on the same day for $5,000 a share. The original seller paid $2,000 a share. He therefore made $5,100 and the second seller made $3,900. All of these transactions, it is said, took place in one day. One of the first transactions in this stock was the sale of five shares for $1,000 or $200 a share. On the day after this sale the purchaser sold two of the shares for $500 a share, thus recovering the amount of his purchase money for the lot. He afterward sold the three remaining shares for about $8,000, which was his profit on the venture. At times the price jumped up $100 a share in an hour. The son of the president of one of the largest corporations in the country sold twenty shares that cost him $2,000—that is to say, $100 a share—for $23,500, or $1,175 a share. The purchaser sold the stock shortly afterward for $1,375 a share. The stock is now selling at the lowest figure it has touched since it came upon the market—namely, $250 a share. A sale was made at that figure not long ago. The price has twice been affected by the increase of the company's capital, as the increase in capital has been offered to the stockholders at par. At the present market value of the shares of the Edison Illuminating and of the Edison Isolated companies, it is estimated that the stock of the parent company is worth about $150 a share, merely as representing the interest of each share in the aggregate market value of the stocks held by the company.

The capital of the Edison Illuminating Company is $1,000,000, and the par value of its shares is $100. Fifty-one per cent. of its stock was given to the parent company for the Edison patents, which it is entitled to use exclusively in New York City. The company proposes to light the city by districts. Its first district is bounded by Spruce street, Park Row and Broadway, and the East River. It has equipped an engine house in Gold street, and laid wires and put in fixtures extensively through this district, but has not yet succeeded in furnishing any light to speak of, though it has about 6,000 lamps which have been lighted at times. The stock of this company has sold as high as $125 a share and as low as $30. The former price was reached before the company had got much of its plant, and the latter a few months ago. The last sale is reported to have been at $50 a share, and it is now offered at $50, $40 a share being bid for it.

The Edison Company for Isolated Lightning was organized with a capital of $500,000, which was subsequently increased to $1,000,000. The par value of the shares is $100. The object of the company is to furnish light by the Edison system and patents to single buildings or establishments. Fifty-one per cent. of its stock is owned by the parent company, having been issued to it for the patents and privileges. When the capital of the company was $500,000 its stock first sold up to $240 a share, and then as low as $175 a share. The stock now brings $155 per share. It is offered at $155, and $140 is bid. The price at present, however, depends to an extent upon the number of shares offered or bid for. This is the only Edison company that has paid a dividend. One of ten per cent. out of the operations of the last year has recently been declared. Though the parent company has never paid a dividend, large profits have accrued to its stockholders by two awards of new stock at par at times when the premium was very great.

The Edison Electric Light Company of Europe was organized about two years ago, simultaneously with the other offshoots of the original company. Its capital is $2,000,000 and the par value of its shares $100. It has a monopoly of the Edison system in Europe. Its stock sold soon after it came on the market at $165 a share, and has declined to $40. The present quotation is $40 bid, $55 asked.

The capital of the United States Electric Lighting Company is $1,500,000. Its shares, of the par value of $100 each, sold about three years ago at $300 per share. During the extreme depression in this class of stocks about six or seven months ago, its stock sold at $82.50 a share. The last reported sale was at $125, and at present $130 is bid and $150 is asked. The company has just declared its first dividend. It is five per cent in cash, but whether it is to be considered as an annual, a semi-annual, or a quarterly dividend cannot be learned.

The patents of the United States Company are used extensively in this city by the United States Illuminating Company, which has a capital of $1,000,000, only one-half of which has been issued. The transactions in its stock have not been large. The last was at $103 per share.

The Brush Electric Company of Cleveland sustains practically the same relation as the Edison to several minor companies. It has a capital of $3,000,000 in $100 shares. The stock sold recently at $110, and it is said that it can be bought at that price now. The present bid price is $100. It has never sold below its par value. The company has paid quarterly dividends of two per cent. for three years.

The Brush Illuminating Company of New York uses the Brush inventions and systems in this city. It furnishes, it is said, over 1,000 lights nightly in the uptown district, which it supplies at an average of 80 cents a light per night. It began furnishing street lights to the city at 40 cents a light per night, but the price has been advanced to 70 cents. The cost to the company is said to be 50 cents. It is reported that the company will earn $100,000 net this year. The capital is $1,000,000, and the $100 shares have sold as high as $125, and about three months ago had dropped to $70. The current quotation is $100 bid and $110 asked.

The Brush Illuminating Company of New York owns most of the stock of the Brush Electric Light Company of New England, which uses the Brush system throughout the Eastern States. This stock is not dealt in, but is supposed to be worth about $500 or more a share. The company has just declared an extra cash dividend of 30 per cent., making a total of 58 per cent. that it has paid within a year. The report is current that the New York and New England companies contemplate a consolidation.

The Fuller Electrical Company manufactures electrical machines. It has a capital of $870,000, of which $300,000 is common stock and $570,000 preferred. The par value of both classes is $100. The common stock has sold from $32 to $22 a share, and the preferred from $61 to $75 a share. Present quotations are $30 bid for the common, offered at $32, and $75 bid and $100 asked for the preferred.

The American Electric Light Company has been distinguished chiefly for the counter-charges of fraud that some of its officers exchanged a few months ago. The company has a capital of $500,000 in $50 shares. Some of these shares have sold at $35. They are now offered at $4.75.

The Brush-Swan Electric Light Company is the last organized enterprise of this class. It combines all the Brush and Swan inventions, and uses electricity generated by the Brush process in the Swan incandescent lamp. The capital of the company is $600,000, and the par value of its shares is $100. Sales have been made at $150 a share, and it is now quoted at $105 and $150 asked.

For the common protection of their patents, all of the leading electric light companies formed some two years ago the Gramme Electrical Company. The shareholders are the American Electric Company of New Britain, Conn.; the Brush Electric Company, the Edison Electric Light Company, the Fuller Electrical Company, the Jablochkoff Electric Lighting Company, the United States Electric Lighting Company, and the Weston Electric Light Company. The stock has no marketable value.

While the prices that now prevail for the shares of most of the electric light companies are the lowest that have ruled, it will be observed that there has been a considerable recovery in the case of those companies which have demonstrated their ability to make returns upon the money invested in them. These, however, are few in number, and, with the exception of the Edison Isolated, are companies that furnish only the large lights that can be utilized chiefly for out-door lighting or for the illumination of large areas. The small light that is required for general in-door illumination has not yet been furnished for general use, nor has any return been made upon the money invested in its development and introduction. Where bills have been rendered for furnishing the light suitable for office or house purposes, they have, according to some persons who have paid them, been larger than a gas bill would have been for the same amount of service. So far as speculation is concerned, however, the inquiry for electric light shares is, according to the brokers, increasing and the volume of the transactions larger as compared with three or four months ago, when trading in them was at a standstill. This, doubtless, is largely due to the first dividends recently declared by two or three of the companies.—*N. Y. Sun.*

PORT OF ENTRY, TEXAS.—A dispatch from Galveston says: "There is a movement on foot to form a port of entry at the mouth of the Rio Grande. The company is composed of men of capital and great engineering skill. Through a system of jetties a harbor can be formed there that will be of vast service to the United States and Mexico."

VILLAR RESERVOIR ON THE RIVER LOZOYA.*

The Isabel II. Canal, which conveys to Madrid the waters of River Lozoya, began originally at a point called Ponton de Oliva, where the required level was established by a dam 92 ft. high. A supplementary dam 16 ft. high was subsequently built at Navarejos, about 3 miles further up the river, and the canal prolonged up to that point; but the combined capacities of these reservoirs proved insufficient to meet the growing requirements of the capital, and it was decided in 1869 to construct a large storage reservoir at Villar, about 14 miles above Navarejos, capable of holding 20 million cubic meters (4,400 million gallons).

The construction of this dam began in June, 1870, and ended in 1878. The dam is curved in plan to a radius of 440 feet, the convexity being of course on the upstream side. The total length of dam at the top, measured along this curve, is 546 ft., out of which a length of 197 ft. on the right bank is 8 ft. 3 in. lower than the remainder, thus providing an outlet for the overflow of the reservoir. The overflowing water is directed down the valley, and kept from falling on the foot of the dam by a guide-wall 60 ft. long, running radially to the curve of the dam, from the inner end of the outlet. An iron bridge, consisting of twelve spans of 16 ft., runs across the outlet, carrying a roadway which continues along the top of the higher portion of the dam. It was necessary to provide a crossing for the horses and foot passengers over the dam, to replace the Villar bridge drowned by the reservoir.

The maximum height of the dam in the center of the valley, from the bed of the river to the highest level the water can attain—*i.e.*, the level of the overflow, is 162 ft. 1 in. The higher portion of the dam rises to 8 ft. 3 in. above this level, and is provided with parapets.

The figure of the cross-section of the dam can be very approximately described as follows: The inside, or upstream face, is vertical from the line of the highest water-level to a point 84 ft. 3 in. below, while the outer, or downstream face, batters at an irregular rate down to the same level.

The thicknesses down to this level run as follows:

	Ft.	In.
At and above overflow level	14	9
At 10 ft. below overflow level	16	5
At 20 " " "	19	4
At 30 " " "	24	8
At 40 " " "	30	2
At 50 " " "	36	9
At 60 " " "	44	8
At 70 " " "	52	10
At 80 " " "	61	4
At 84 ft. 3¼ in. overflow level	65	11

From 84 ft. 3¼ in. below overflow-level the inside face batters 1 in 3.57, and the outside face continues with a uniform batter of 1 in 1.163, till they respectively strike the rock in the bed of the river.

Two galleries run through the dam at a depth of 143 ft. below overflow level. Each of these has a clear inlet area of 19 square feet divided into two compartments, closed by sluices governed from a central tower built on to the inner face up to the level of the roadway. These sluices are worked by hydraulic power derived from a spring found on one of the banks 2,000 ft. distant from and about 200 ft. higher than the dam. The strain on each sluice-rod with a full reservoir is 8½ tons.

Besides these two galleries, four tunnels have been driven through the rocky sides of the valley, to provide an outlet for flood-waters, and avoid, if possible, the higher overflow coming into use. Two of these issue from the same level as the galleries, a third one from a point 50 ft. higher, and a fourth from a point 77 ft. higher.

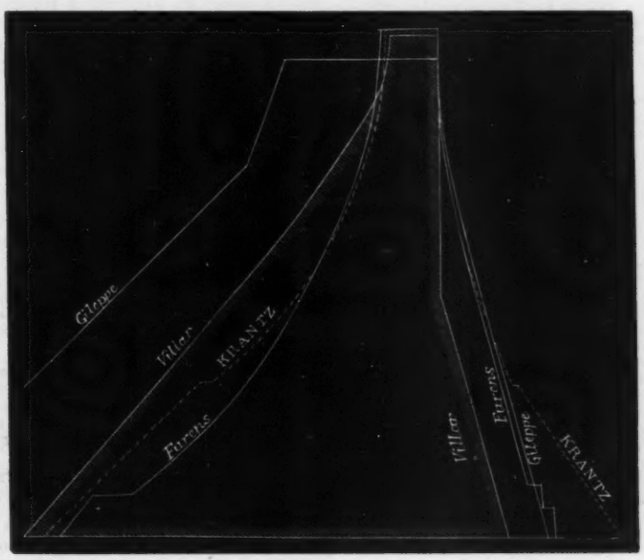
The whole of the dam is built of hydraulic rubble masonry, except the lower part of the tower and the top course of the dam, which are of ashlar.

The total cost of the reservoir, including the bridge and the tunnels, was £80,556. The materials were supplied by contractors, and cost £42,000. The construction was executed by day labor, and cost £38,556.

The sectional area of the dam from overflow-level down to a horizontal line 162 ft. 1 in. below is 1,275 square yards, and may be considered as a fairly light one. The Furens dam, which is of about the same height (164 ft.), only measures about 1,200 square yards in area; but the Gileppe dam, if carried up to the height of 164 ft. (which emergency was contemplated and provided for by its designers), would present an area of 2,130 square yards. The type calculated in Krantz's work for a height of 164 ft. has about 1,330 square yards area.

The Villar dam is slightly narrower at the base than the Furens dam, and much narrower than the Gileppe dam, or Krantz's type. Its thickness at 162 ft. below overflow is about 154 ft. The Furens dam measures 159 ft. at the corresponding depth, according to the plate in Krantz's work, and the Gileppe 216 ft. The Krantz type, for a height of 164 ft., gives 185 ft. as the proper thickness at base.

The engraving represents the comparative outline of the sections of the Gileppe, Furens, and Villar dams. Krantz's type is figured in dotted lines. The outline of the Furens dam has been taken from Krantz's work. That of the Gileppe dam has been plotted from the dimensions given in a notice printed in these Minutes, vol. xlviii., p. 312. The Villar dam was designed and constructed by Mr. José Morer, Chief Engineer to the Spanish Government.



COMPARATIVE SECTIONS OF THE VILLAR, FURENS AND GILEPPE DAMS.

N. B.—The outer slope of the Gileppe section is continued to the base at the same angle.

* By Edward John Theodore Manby, M. Inst. C. E. From selected papers of the Institution of Civil Engineers. This paper has been mainly compiled from information given in a series of articles in the "Revista de Obras Publicas," Madrid, supplemented by additional particulars from other sources.

EELS THAT JUST FIT THE WATER PIPES.—There has been trouble in the Brooklyn City Hall on account of eels in the water pipes. Two big eels were found in the pipes some time ago, and the water ceased to flow until they were removed. Thursday, when the water stopped, the cause was traced to an eel which fitted the pipe tightly. "The eels come from the ponds and streams on Long Island," said a City Works official, "and are pumped into the reservoir, whence they have an easy trip into the city. They sometimes get stuck in a pipe which they exactly fit, and then there is trouble. We cut out a section of pipe some time ago containing an eel, and we preserve it now in alcohol as a curiosity.

NEWS OF THE WEEK.

RAILWAY CONSTRUCTION IN 1882.—The *Railway Age*, this week, will publish a summary of the railway construction in the United States for the year 1882. The summary covers only the main tracks, and shows the construction in 45 of the 47 States and Territories, on 342 lines, to aggregate 11,343 miles, or about 2,000 miles more than in 1881, which exceeded the construction in any previous year by 2,000 miles. The construction is divided as follows: In five New England States, 53⅛ miles; in four middle States, 1,315⅕ miles; in five middle Western States, 2,077¼ miles; in eleven Southern States, 1,490¼ miles; in four States in the Missouri River belt, 2,068½ miles; in five States in the Kansas belt, 2,157¼ miles; in five States in the Colorado belt, 1,165 miles, and in six States in the Pacific belt, 1,020 miles.

HUDSON BAY NAVIGATION.—Correspondence is going on between the Imperial government and Canada looking toward entering into a joint arrangement for surveying Hudson Bay and Straits, and to put a vessel in the bay during the present season to ascertain the length of time the waters are open for navigation.

WATER-WORKS COMPANY FOR OAKLAND, Cal.—The Mayor of Oakland has signed the ordinance recently adopted by the City Council granting to J. G. Diroll and William G. Long the right to lay down and maintain water pipes in the streets. The ordinance gives the parties a water franchise, without a limit, upon the following conditions: That within two years the work of laying the water pipes is commenced; that the pipes shall be laid and good fresh water running therein ready for distribution before the expiration of five years, the ordinance to become void if the work is not so completed; that the city shall have the right to erect hydrants at its own expense at any and all points along the line of pipes, and connect the same with the pipes and use the water free of expense to the city, in quantities sufficient for all fire purposes, for supplying the City Hall, City Hall square, all drinking fountains, for sprinkling the street and flushing the sewers. The grantees propose to bring the water from the Tuolumne river, in the neighborhood of which they claim they have met natural reservoirs at so high an altitude that snow exists all the year round; that trees do not grow, consequently the water cannot be defiled by decaying vegetable matter, etc. They have already secured franchises in all of the towns throughout the County of Alameda, through which they intend carrying their supply pipes, and intend to commence operations at once, as a good deal of flume-building will have to be done.

SEWERAGE FOR WILMINGTON, DEL.—On the 20th inst. the City Council held a special meeting to receive the report of Rudolph Hering, civil and sanitary engineer, of New York, and discuss his plan for a system of sewerage for that city. The plan as drawn provides for a system capable of draining the entire area lying within the city limits serving double the present population and carrying the sewerage to the Delaware River, the cost of construction, carefully estimated, being $546,000. It can be partly constructed so as to drain the present populated portion of the city and deliver the drainage temporarily into the Christiana River at a cost of $230,000, this being the lowest estimate for which the city can construct a system to meet its immediate requirements. The plan provides for draining into the Christiana for present needs, afterward continuing the outlet to the Delaware River if necessity demands it. The plan and report was received and referred to the Committee on Sewerage and that committee instructed to devise a plan to secure the money necessary for and to report upon the advisability of building the sewers.

RAIL PRODUCTION IN 1882.—The Secretary of the American Iron & Steel Association, Pittsburgh, reports that returns have been received from all the mills in the United States which rolled iron and steel railway bars in 1882. The total production of iron and steel rails last year was 1,683,794 net tons, being a falling off, as compared with 1881, of 153,306 tons. No rails were made during the year in New Jersey, Virginia and Georgia. Of the entire out-put, 1,438,155 tons were Bessemer steel rails, 227,874 tons iron rails, and 22,765 tons open-hearth steel rails. The five leading rail-making States were Pennsylvania, which produced 850,908 tons; Illinois, 362,250 tons; Ohio, 113,806 tons; New York, 155,021 tons, and Missouri, 85,528 tons.

ARTESIAN WELL.—The Northern Pacific artesian well at Wheatland, Dak., is down 818 ft. At that depth water was found which flowed over the top, but contained so much soda that it was useless for railroad purposes. The well will be sunk deeper until pure water is found.

THE BELL WATERPHONE.—The adoption of the Bell waterphone system by the Cincinnati water-works, about one year ago, has shown its good

results during the present emergency caused by the floods. Even during the excitement, the night inspection with the waterphone for leaks was continued and resulted in the detection of several instances of waste and the consequent shutting off of the supply from those detected. Had the wasteful habits and underground leaks continued, the consumption now would have been 23,000,000 instead of 15,000,000, and a water famine would have occurred, as the reserve in the reservoir was rapidly being used and the pumps were flooded. The daily use of water is shown in the following comparative table:

	January.	February.
1879	15,430,638	15,198,733
1880	15,369,532	15,452,402
1881	18,406,655	19,515,450
1882	17,287,479	17,751,835
1883	16 264,000	15,320,687

EAST TENNESSEE, VIRGINIA & GEORGIA R. R.—The Ohio division of this road is completed to the Kentucky State line. There it will be met by the extension of the Louisville & Nashville's Knoxville branch.

UNDERGROUND WIRES.—In London there are five thousand miles of telegraph wires underground within four miles of the post-office. The telegraph wires between Marseilles and Paris are being put underground at a cost of $8,000,000.

WATER-WORKS WANTED.—Corsicana, Texas, asks the Legislature to change the law relating to the issuing of bonds above a certain amount, that it may issue bonds for the purpose of securing a water supply.

ELEVATED R. R. IN VIENNA.—A concession has been granted by the Emperor of Austria for the construction of the Elevated Metropolitan Railway in Vienna. It is to construct all the railway termini with the principal streets and the suburbs. The work is to be completed within four years, and the first part within two and a half years. The cost is estimated at $25,000,000. The whole material must be of Austrian manufacture, and will come from Rothschilds' iron works at Witkowitz and Teplitz. The chiefs excepted, only Austrian engineers are to be employed. The engines are probably to be worked by electricity.

RAILROAD FROM ATLANTIC HIGHLANDS TO KEYPORT, N. J.—This road will be constructed this spring, and at Keyport will connect with the Freehold & New York Railroad to Matawan.

WATER-WORKS MORTGAGE.—A mortgage for $150,000 has been given by the water-works company, of Fort Worth, Tex., to the Farmers' Loan and Trust Company, of this city.

ARTESIAN WELL FINISHED.—The Texas & Pacific Railway Company have finished the artesian well at Toyah. The well is 800 feet deep and flows 7,000 gallons per day.

WANTS TO STRAIGHTEN THE LEANING TOWER.—An exchange says that a "Yankee engineer" thus addresses, in a Paris paper, all "whom it may concern:" "Having visited the leaning tower at Pisa, Italy, I am fully convinced that the architectural grandeur and beauty of this ancient and colossal relic of the past ages can be wonderfully improved. I hereby offer to contract to put this immense structure in a perpendicular position, and raise it to a level of the ground for the sum of $600,000, the terms of payment and time of completion to be agreed upon, the time not to exceed ninety days."

NEW ORLEANS & MISSISSIPPI VALLEY R. R.—On the Memphis division of this road the distance between Memphis and Vicksburg, according to the surveys made, is about 215 miles. Of this contracts have been let for sixty miles of the distance from Vicksburg north, and sixty-five miles from Memphis south. Contracts have been let on the 100 miles south of Memphis as follows: Donnelly & Co., contractors, have the first eight miles. J. B. Colt & Sons have the next seven miles, and Burke, Foley & McMahon the next fifty miles. The remaining fifty is comparatively easy, and rapid progress can be made. All the above contractors are to have their work of grading finished by July 1. There are about 900 men now engaged by them, but the wet weather of the past ten days, together with the threatened overflow of the Mississippi River, will naturally cause delay. The route of the line has been definitely located to Bear Lake, Tunica County, Miss. It will probably cross the Sunflower River at Clarksdale, in Coahoma County, pass Beaver Dam Lake three or four miles east of Austin, and go between Jonestown and Friar's Point. McCollan, Gates & Co. have the contract for all the piling and bridging between Memphis and Vicksburg.

REGULATIONS GOVERNING ELECTRIC WIRES IN PHILADELPHIA.—The Council has passed an ordinance to regulate the introduction and management of underground conductors. It provides that not more than 500 feet of street shall be opened at one time; the trenches to be not more than 2 feet wide. The city to have the use of the wires for police, fire and municipal purposes. Returns to be made of the location and length of all wires. An annual tax of $5 will be laid upon each mile of overhead electric light wire, and each mile of exposed telegraph or telephone wire will be taxed $2.50 per year. Underground wires, when used for electric lighting, will be annually taxed $2.50 per mile, and when used for telegraphic or telephonic purposes, $1 per mile, and an annual license charge of five cents a foot will be laid upon all underground conduits over six and not less than twelve inches in diameter. Larger conduits will be charged ten cents per foot. Security to the amount of $10,000 will be required from all parties laying the wires and all plans will be subject to the approval of the Superintendent of Police and Fire Alarm Telegraph.

BRIDGE AT SAN ANTONIO, TEX.—The new iron bridge at Houston street is nearly finished. The council contemplates building another bridge across the river at Market street.

SOUTHERN TELEGRAPH COMPANY.—This company, which was organized under the laws of this State a year ago with a capital of $5,000,000, has completed lines from Washington to Richmond, Norfolk and Lynchburg, and according to one of its directors expects to have its lines completed between Washington and New Orleans by Sept. 1, 1883. The lines from the present northerly terminus are being constructed and construction from New Orleans north will be begun in March.

PIPE CONTRACT LET.—The contract for pipe and branch castings for the Mt. Vernon water-works has been awarded to the Cincinnati & Newport Iron and Pipe Company, of Newport, Ky.

DRAINAGE WATER.—The London *Times'* Berlin correspondent says: "The Municipal Council of Berlin have now under consideration a new and ingenious system of disposing of drainage water, the invention of a private chemist here. The need for something of the kind has long been felt by the municipality, as the present method of using up the contents of the Berlin drains, by irrigation in the immediate neighborhood of the capital, has been found defective from a sanitary point of view. The main features of the system now proposed for adoption are that, by a very simple and inexpensive chemical and filtration process, the more solid elements in drainage water can be detached and used as a rich manure, and that the water remaining can not only be purified to a degree which would enable it to be discharged into rivers without the danger of polluting them, but also drunk by human beings without poisoning them. Whether the inventor himself has tested his process in the latter respect does not appear, but his method is at least worth the attention of all who are interested in sanitary reform."

WATER-WORKS FOR BOONVILLE, MO.—The engineers for the water-works under the Perkins system have commenced operations by making a survey of the city.

IRON BRIDGES IN TEXAS.—A note from Fort Worth says: Three iron bridges are now being built in the county; at Fish-trap, Dido and Brickyard crossings. The total amount of scrip issued to the King Bridge Company was $20,523.

WATER-WORKS REPORT, WESTFIELD, MASS.—Number using water, 1,040; receipts for last year, $10,637; total outlay during year, $1,690.

PLASTERERS' WAGES.—The plasterers of Peoria, Ill., have resolved to ask $4 per day. The journeymen plasterers of San Francisco will demand $5 per day after March 1.

CENTRAL PACIFIC R. R.—A contract has been let to build 25 miles of the branch from Berenda to the Yosemite Valley. The road will follow up the Chowchilla, and the division to be contracted for is to be completed by May 1st, in time to accommodate the Yosemite travel this season.

PRICE OF ELECTRIC LIGHT IN THIS CITY.—The Edison company charge $1 per 1,000 candles of light, which is equal to gas at about $2 to $2.25 per 1,000 feet.

IRON BRIDGE AT EASTHAMPTON, MASS.—A new iron bridge is to be built over the Park street crossing in the spring by the New Haven and Northampton company.

BRIDGE AT FORT ATKINSON, WIS.—The Chicago & Northwestern R. R. has completed a bridge across Rock River at the above point.

ELECTRIC LIGHT IN MOBILE, ALA.—The electric light has been introduced in the factories.

ATCHISON, TOPEKA & SANTA FE.—This road has decided to build the Le Joza, cut-off, surveyed from Le Joza to Benson, Arizona, last year.

FLOOD DAMAGES IN NORTHERN OHIO.—The Cleveland roads are not suffering from the effects of the rains which caused the prevailing disastrous floods in the southern part of Ohio, but they have not recovered from the floods of a week ago. The Valley road, which lost ten bridges between Cleveland and Akron, did not turn a wheel out of Cleveland since the 5th until yesterday. The Connotton Valley road and the other roads in general are starting passenger trains on time, but they suffered delay caused by the more or less blockaded condition of freight. Work is now going on on the piling of the temporary Lake Shore bridge at Fremont, but the bridge will not be completed within eight or ten days, and as a consequence the Lake Shore road has only one track between Cleveland and Toledo, and is suffering a serious blockade of both east and west bound business.—*Cleveland Herald.*

GAS COMPANY OF PARIS FAILED.—The Compagnie Générale du Gas has failed. The capital was 1,530,000 francs.

MICHIGAN CENTRAL EXTENSION.—The extension to Alpena has been surveyed from Beaver Lake on the Central to a point 21 miles from Alpena. The line is very favorable.

DARDENELLE & RUSSELLVILLE R. R.—This new line has filed articles of association in Arkansas. Capital stock $45,000. Directors are James K. Perry, Thomas Cox, G. M. Kimball, Ed. W. Cunningham, and C. M. Freed.

CAROLINA, CUMBERLAND GAP & CHICAGO R. R.—The prospect of the early commencement of this road is good. In two years it is proposed to have that portion of the road in South Carolina open.

A PENNSYLVANIA R. R.—Engineers are running a line for a railroad through Fulton county. The road begins at Selins Grove, and runs to Hancock, Maryland.

TUNNEL ON THE CINCINNATI & EASTERN R. R.—A tunnel two miles long is to be built under a hill near Cincinnati for this road.

ATLANTIC & PACIFIC R. R.—This road has completed 471 miles of its line, leaving only 89 miles to build to the Needles.

ELECTRIC LIGHT AT FOND DU LAC, WIS.—Work is again in progress upon the electric light towers.

DENVER & RIO GRANDE R. R.—The grading is all done between Salt Lake City and Denver and all bridges are up except that over Green River, which is ready to put up as soon as the tracks touch the river, so as to haul it there. But 40 miles of track remain to be laid.

SOUTHERN PACIFIC R. R.—Track-laying has commenced on the Mexican branch into Mexico. Forty miles are graded and ready for the track, and a strong force was put on both grading and track-laying. The work is light and progress for the first 180 miles will be rapid.

RUSSIAN RAILROADS.—ST. PETERSBURG, Jan. 26.—During the ensuing year surveys will be made for the following new lines of railway: From Samara through Ufa to Omsk; from Ufa to Ekaterinburg; a continuation of the Ural Railway from Ekaterinburg to join the above Samara-Omsk line, and farther on, in the direction of Troitsk; from Tmerioka to Novselsk the East Donetz line; from Lugan to Millerovo, the branch to Novorossisk; from Wioldau to Toukoum, and from Ryieff to Viazma.

AN IRISH CANAL.—A Dublin journal invites capitalists or the Government to construct a ship canal between Dublin and Galway, thus cutting Ireland in two with a water-way that shall connect the Irish sea and the Atlantic. Steamers would in that case go across Ireland instead of rounding Cape Clear, saving, it is calculated, a thousand miles of sea, and shortening the passage to New York by one day. The estimated cost is put down at about £50,000,000, and in the course of the work, it is said, a million acres of bog land would be drained and brought into cultivation. The length of this canal will be over a hundred miles. After all, the scheme is not much more visionary than the Manchester Ship Canal, which is being earnestly taken up by many hard-headed men of the North.

MISSOURI PACIFIC.—In the Missouri Supreme Court last week arguments were heard on the respondent's demurrer to the alternate writ in the important *mandamus* case in which the State at the relation of the Attorney-General is seeking to compel the Missouri Pacific Railway Company to rebuild and operate the line of narrow-gauge railroad between Kansas City and Independence, being 10 miles of railroad which was torn up and destroyed by the company in November, 1881. The demurrer contends that inasmuch as they have a right to change their gauge from a narrow to a standard-gauge road, it was necessary for the State to allege that the destruction of the narrow-gauge road was not done by the company for the purpose of laying down a standard-gauge road. The road has remained dismantled for over 15 months, and the attorneys for the State argued that this circumstance, in connection with other averments in their petition and writ, showed that the company mean destruction and not change, and that it is incumbent upon the company to allege and prove by way of affirmative defense in their return to the writ that they are only changing their road to a standard gauge, if they wish to raise any such issue.